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Chatham Waters
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Introduction

Chatham's Waters

When we think of Cape Cod, we think of water. Water dominates our landscape and our history. The region's landscape was shaped by multiple glacial ice ages. Humankind's history on the Cape traces back through the Monomoyics and Wampanoag Tribes to over 10,000 years ago.

Archaeological evidence of shoreline campsites, extensive shell mounds and water-centered legends attest to the central importance of water in the lives of the Cape's first inhabitants. Early settlers from Europe built their villages around harbors or along freshwater streams that provided water for livestock, shallow wells, and dams that harnessed the water's energy for mills. Like the Native Americans, they depended heavily on fish and shellfish harvested from the freshwater ponds, estuaries and the ocean. In later years, marine commerce, fishing, boat building, and whaling became the Cape's economic mainstays.

Chatham has 66 miles of coastline, one of the longest in the Commonwealth. Perhaps the single most obvious and widely cherished feature of our waterways is their beauty. Our many embayments, tidal rivers, marshes, freshwater ponds, and beaches all have their own character and natural beauty.

Embayments

Embayments consist of harbors connected to the Atlantic Ocean and Nantucket Sound and tidal estuaries (see map on page 4). Estuaries are places where fresh and salt waters meet and mix and are some of the most productive ecosystems on earth. With beaches, marshes and eelgrass beds, an estuary provides critical spawning, nursery and feeding areas for countless species of birds, shellfish, and finfish that are commercially important to us all. Oysters, clams, quahogs, bay scallops and crabs spend their entire lives in estuaries. Crabs, worms, eels and other invertebrates provide vital food sources for the larger fish and birds living and/or feeding in the estuary. The largest salt marshes in Chatham are found along the Nantucket Sound shoreline, located behind the barrier beaches of Stage Harbor, Harding's Beach, and Cockle Cove Beach. Marine and freshwater wetlands serve many critical environmental functions. They act as pollution filters, buffers against storm damage and flooding, and provide habitat for many spawning and juvenile species. Approximately two-thirds of the landed value of commercial catch on the East Coast of the United States comes from species that live at least part of their life cycles in estuaries.

Bassing Harbor System:

The system consists of Bassing Harbor, Crows Pond, Ryders Cove and Frost Fish Creek, all sub-embayments to Pleasant Bay. Bassing Harbor is the outermost basin in this system and exchanges waters with Pleasant Bay. The Harbor is a relatively stable, high habitat quality system, with good eelgrass beds. Crows Pond, an inland sub-embayment, is a deep pond with eelgrass beds around the periphery. Ryders Cove is the innermost sub-embayment of the system. The full basin appears to have supported eelgrass beds in the past, many of which do not exist today. Ryders Cove is the entrance to Chatham's only remaining active herring run leading to Stillwater Pond and Lovers Lake. Frost Fish Creek is a tributary system to Ryders Cove that is primarily a salt marsh with a central basin. Frost Fish Creek has undergone significant changes resulting from past cranberry bog activities and construction of Route 28.

Muddy Creek:

Muddy Creek exchanges tidal waters with Pleasant Bay and extends from Pleasant Bay to Route 137 and Old Queen Anne Road. During the late 1800's and into the 1900's, it was divided into an upper and a lower portion by a dike whose weir was removed or washed away. Similar to Frost Fish Creek, the ecology of Muddy Creek was altered by the construction of Route 28. Anecdotal evidence suggests that Muddy Creek did support a herring run into Minister's Pond and Mill Pond.

Photo by Geri Appleyard

Stage Harbor System:

Stage Harbor is a multi-use harbor with emphasis on recreational boating, commercial fishing and shellfishing. There are two tidal rivers that lead off the harbor, Oyster River, which connects the harbor to Oyster Pond, and Mitchell River, which connects the harbor to Mill Pond and Little Mill Pond. The System contains some of the most heavily used harbor infrastructure in the Town. The contrast between the busy multi-use harbor and the estuarine ponds and associated habitats contributes to the character, vibrancy and significance of the area. Commercial and recreational harvesting of bay scallops, quahogs, soft-shell clams, and mussels occurs throughout the system. Oysters, once abundant throughout the system are harvested sporadically and are a recreational resource since they are off limits to commercial harvesting

Photo by Geri Appleyard

Pleasant Bay:

Pleasant Bay is widely recognized as one of the richest and most diverse eco-systems in the northeast region. The Bay is separated from the Atlantic Ocean by a barrier beach, which is the most prominent physical feature in determining the health of the estuary. The barrier beach protects the Bay from the harsh impact of ocean waves, while the inlets control the ebb and flow of ocean waters. Presently, there are two inlets that allow tidal waters to flow in and out of the Bay, one formed in 1987 and the other in 2007. The Bay's size and diversity support abundant resources for shellfishing, finfishing, scenic viewing, swimming and boating. The watershed of the Pleasant Bay estuary is rich in wetlands resources that are vital to the area's ecology, its natural beauty, and its commercial and recreational values. Shellfishing and finfishing are important commercial and recreational activities in Pleasant Bay. Quahogs, scallops, mussels and soft shell crabs are historically the most popular shellfish for commercial and recreational fishing. The Chatham Harbor subembayment is a critical off-loading location for Chatham's commercial fishing fleet.

Photo by Geri Appleyard

Sulphur Springs System:

The system consists of Cockle Cove Creek, Bucks Creek and Suphur Springs. Cockle Cove is a salt marsh with a central tidal creek which drains almost completely at low tide. Sulfur Springs is a shallow embayment at the head of Bucks Creek that is transitioning to a salt marsh. Eelgrass has not been observed for over a decade in Bucks Creek. The entire system is undergoing ecological change resulting from the constant physical change at the mouth of Bucks Creek.

Photo by Geri Appleyard

Taylors Pond:

Taylors Pond is a drowned kettle pond connected to Nantucket Sound by a tidal salt marsh, Mill Creek. There is currently no eelgrass in the Pond. This system is also undergoing change due to the physical changes occurring in the mouth of Mill Creek at Nantucket Sound.

Freshwater Ponds

There are over 25 freshwater ponds in Chatham, most of which are windows on our aquifer because they have formed where low areas in the ground surface expose the water table. In size, they range from the tiny 1.2-acre Pinkwink Pond to the largest 41-acre White Pond and Goose Pond (known as "kettlehole ponds"), with a total acreage of over 260 acres. Seven of our ponds are Great Ponds, defined by the state as ponds over 10 acres in size, and owned by the State of Massachusetts in the public trust. These include Emery, Goose, Lovers Lake, Mill, Schoolhouse, Stillwater and White Ponds. Some of the Great Ponds, such as Goose, Schoolhouse, Stillwater, Lovers Lake and White Pond, have public access (some unimproved), and are open to the public for fishing, kayaking, swimming. The smaller ponds, mostly private, have limited public access/use.

Due to the extremely sandy soils found in Chatham, we also have a globally rare type of pond known as coastal plain pond. Found only in southeastern Massachusetts, these ponds are characterized by widely fluctuating water levels, resulting in extreme variations in the width of the pond shore from year to year. They are host to many rare and endangered plant and animal species, including damselflies, dragonflies and turtles.

Chatham's many ponds provide for various types of recreation such as swimming, fishing, boating, ice-fishing and bird watching. They also serve as habitat for many species of fish and waterfowl and their shores provide habitat to many plant and animal species. These waters and shoreline provide a place of scenic beauty and solitude for Chatham citizens.

Lovers Lake

Photo by Geri Appleyard

Pond	Area (Acres)	Public Access	Activities
Mill Pond	24	Unimproved	Fishing
Goose Pond	41	Fisherman Landing	Fishing
Schoolhouse	23	Town Beach	Swimming, Fishing, Kayak/canoe
Lovers Lake	38	Unimproved	Kayak/canoe, Fishing
Stillwater Pond	19	Unimproved	Kayak/canoe, Fishing
Emery Pond	14	No	Kayak/canoe
White Pond	41	Landing	Swimming, Kayak/canoe, Fishing

Cape Cod Pond and Lake Atlas, Cape Cod Commission, 2003

Protecting Our Waters
Together we can make a difference!

Today the well-being of our town is still intimately linked to the health of our waters. We are never far from estuaries, ponds and beaches. Many residents fish local waters for sustenance. Seasonal residents and tourist flock to the Cape to bask and hike on its beaches, swim in its waters, catch and eat local fish and shellfish, and go boating on its sparkling bays. All these activities require clean water and a healthy marine ecosystem. We share our waters with a vast array of aquatic plants and animals. We depend on them to maintain the ecological balance that keeps our paradise intact. They need our help to survive.

During the past several decades, Cape people have noticed that the water quality of salt ponds, harbors, and shorelines has been deteriorating. The water grows greener and murkier in the summer months. Slime algae proliferate on rocks and dock ladders; the numbers of valued fish and shellfish are declining. Studies by local scientists and shellfish wardens confirm that areas in some estuaries lack enough oxygen to sustain life.

Many of our current water quality problems result from land use practices, rapid local development and population growth. Every additional septic system and newly fertilized lawn further pollute the waters. Each house may seem unimportant by itself, but multiply the impact of a single household by thousands of households and it becomes clear why our irreplaceable water resources are deteriorating before our eyes.

Monomoyicks and Champlain

The Chatham area was originally occupied by the Monomoyick branch of the Wampanoag tribe and was called Monomoit. Samuel de Champlain was the first known European explorer to anchor in Stage Harbor, in 1606. He described Chatham as an area "where there is much cleared land and many little hills" where the natives planted corn. He said of the Native Americans that they were "not so much hunters as fisherman and tillers of the soil." Stage Harbor was full of oysters, other shellfish and many fish. Champlain explored a good part of Chatham and drew an excellent map and description of the area. Although relations with the Native Americans started out well, hostilities soon broke out over a stolen axe. Six Frenchmen and an unknown number of natives were killed. Incidents like this and others made the Cape natives hostile to Europeans for some years, until the founding of the Plymouth Colony in 1620. Governor Bradford, with the help of Squanto, made a lasting peace with the Native Americans on Cape Cod in 1630.

The good news is that it's not too late to save our waters – if each of us plays our part.

We all want to protect our water resources, but often we do not know what we can do. *Chatham Blue Pages* will give you some ideas. It begins with the big picture – providing everything you need to know about the Cape's water cycles – and then identifying actions that each of us can take to safeguard our region's waters. Many of the solutions are simple; some will even save you money. Join us to protect the health of our waters.

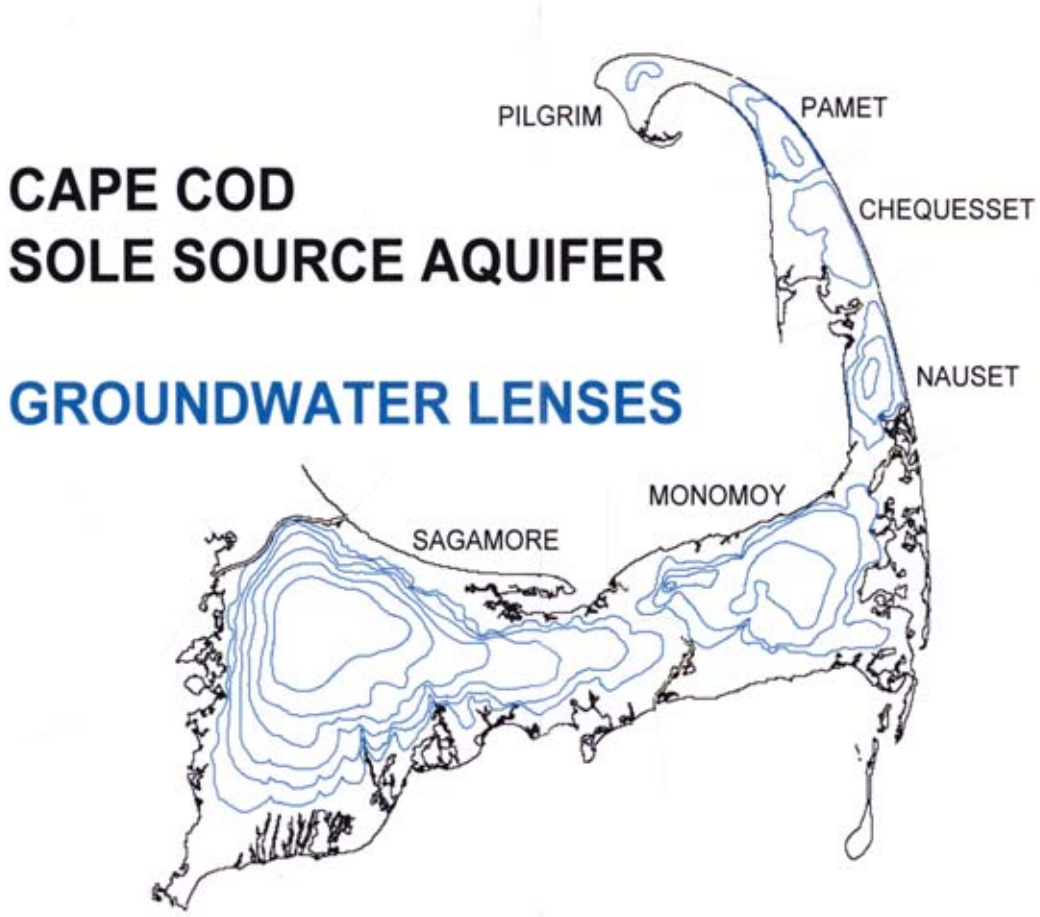
Please keep this booklet near your phone book as a handy reference. Share it with members of your household, or lend it to a neighbor or friend. If you are a landlord, give your tenants a copy; most likely they will also want to know what they can do to protect our waters.

From Glaciers to Kettle Ponds

Some 10,000 years ago, as the last glacier receded from this, its southernmost reach, the Cape was formed by the deposit of sand and debris over an ancient clay base. Colder, denser blocks of ice remained embedded in the substrate, and when these finally melted, the terrain collapsed, producing hollows. These then filled with groundwater, forming the freshwater ponds and lakes of Chatham. Later, as the sea rose, forming what are now Pleasant Bay and Chatham's South Coast embayments, some of these ponds – Crows Pond, Ryders Cove, Oyster Pond and Mill Pond are examples – became connected to the ocean and Nantucket Sound.

Cape Cod Aquifers

All of our drinking water, whether from municipal water supplies or from private wells, comes from the rain and snow that falls on Cape Cod and soaks into the sandy soils left by the glacier. The entire layer of groundwater beneath the Cape is referred to as the Cape Cod Sole Source Aquifer and is made up of six separate freshwater lenses. Lenses can be thought of as mounds of groundwater bordered by marine water at the edges, bedrock on the bottom, and separated from each other by tidal rivers or inlets that cut across the Cape peninsula. Groundwater is the subsurface water located beneath the water table, in soils and geologic formations that are fully saturated.



The drinking water for Chatham and adjacent towns to the north and west is drawn from one large aquifer that lies beneath these towns. This large aquifer is called the Monomoy Lens. This lens is approximately 300 feet thick. deeper than the height of the Provincetown Monument, and is the sole source of drinking water for over 40,000 homes and businesses in six towns. More than five million gallons are pumped out each day in the off-season. When our population triples in the summer, so does the water consumption. The soil types and geologic deposits are relatively continuous and allow water to move through them at a speed averaging one foot per day. Flow from the middle of the Monomoy Lens to the shore – a distance of more than 3.5 miles – takes over 18,000 days, or nearly 50 years. Contaminants that are introduced into the lens and degrade water quality can ruin our drinking water for more than a generation.

In 1982, the Environmental Protection Agency designated the Cape's water supply as a "Sole Source Aquifer." This designation recognizes that the Cape's groundwater is our only source of drinking water.

About 40% of the annual rainfall seeps into the ground to replenish our aquifer.

Chapter 1

A Water Primer

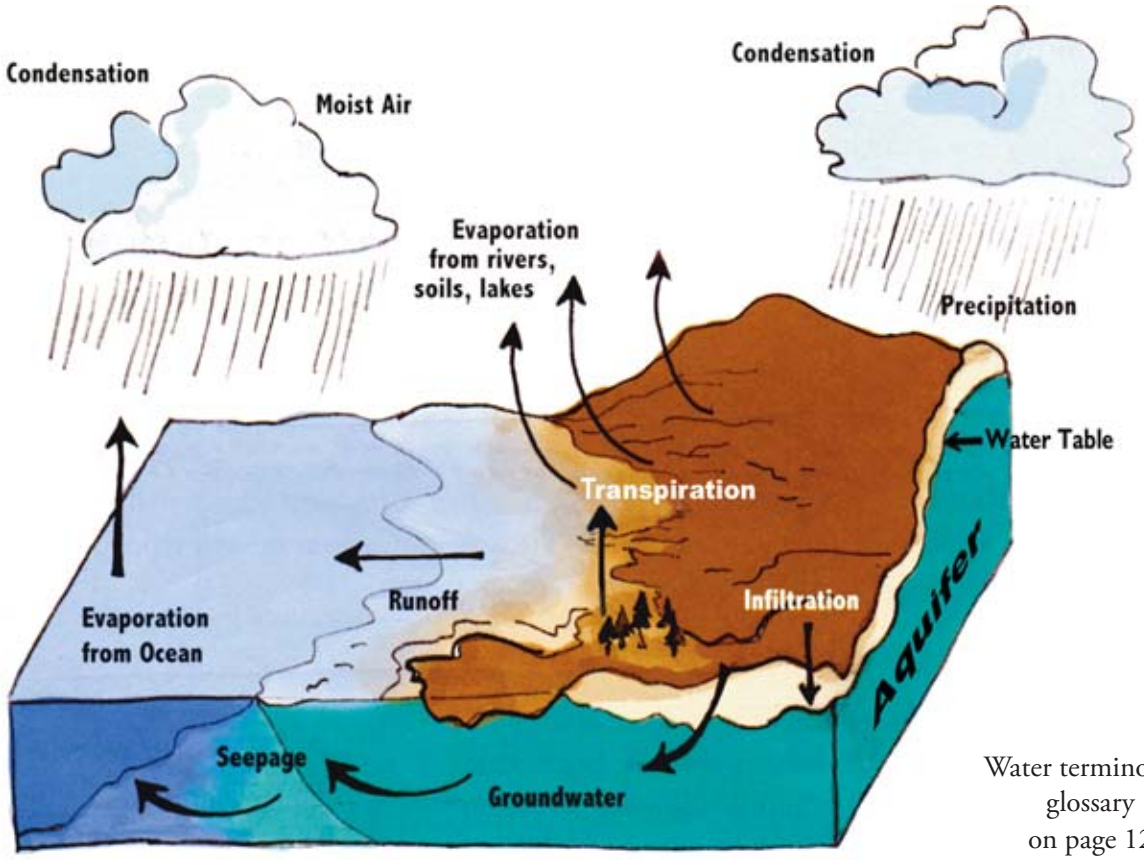
Our Beautiful Blue Planet

From outer space, the earth appears blue. Over three-quarters of its surface area is covered with water. Water is a miraculous substance. It is the universal solvent; just about every element can mix or dissolve in it. Over most of the globe, water exists in its liquid state. In constant motion and dissolving everything in its path, water is the lifeblood of our dynamic planet. This vast cycling and recycling process is called the water cycle.

The Water Cycle: What Goes Around Comes Around!

The water cycle is the journey water takes as it circulates from the surface of the earth to the atmosphere and back again. Energy from the sun evaporates water from the oceans, rivers and lakes. Plants also lose water by transpiration. Water vapor eventually condenses, forming tiny droplets in clouds. When the clouds meet cooler air, precipitation (rain, sleet or snow) is triggered and water returns to the sea and land, and the process begins again.

Water falling on the land either infiltrates into the soil, flows downhill as runoff into the wetlands, ponds and streams or evaporates back into the air. Once underground, water is either absorbed by plants and trees at the surface, or soaks deep enough to reach and recharge the underground sediments that are saturated with water, the aquifer. The surface of the groundwater in the aquifer is the water table.



Water terminology
glossary
on page 12

ARE YOU FLUID IN WATER TERMINOLOGY?

Aquifer: Underground sediments saturated with water.

Condensation: The process by which water vapor (a gas) in the air turns to liquid water. Condensing water forms clouds in the sky.

Evaporation: The process by which liquid water becomes water vapor (a gas). Water vaporizes from the surfaces of oceans and lakes, from the surface of the land, and from melts in snow fields.

Groundwater: Water stored in or moving through the aquifer.

Infiltration: The process by which rain or snow enters the ground and drains into the soil

Precipitation: The process by which water (in the form of rain, sleet, snow or hail) falls from clouds in the sky.

Recharge: The process by which precipitation moves through the soil and reaches the groundwater, replenishing the aquifer.

Seepage: The process by which water in the aquifer moves into rivers, estuaries and the ocean.

Transpiration: The process by which some water within plants evaporates into the atmosphere. Water is first absorbed by the plant's roots, then later exits by evaporating through pores in the plant.

Water table: Underground, the top level of soil permanently saturated with water. A household well taps into water below the water table.

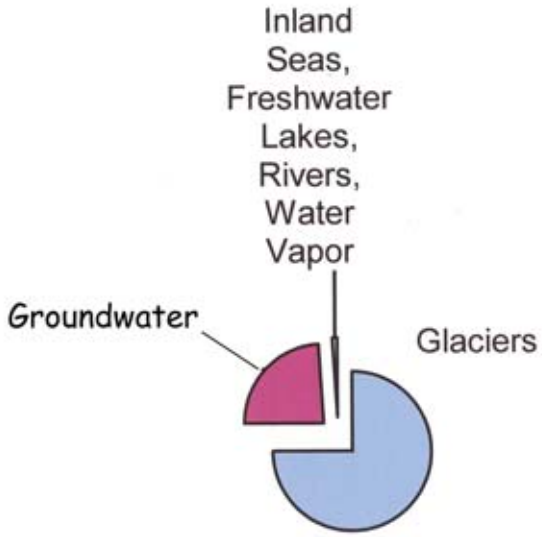
The human body is 70% water. Our eyes are 99% water. Plants contain from 70% to 90% water.

Earth never gets any new water; it just changes form. The water you drink today might have watered the gardens of ancient Egypt.

Waters of the World

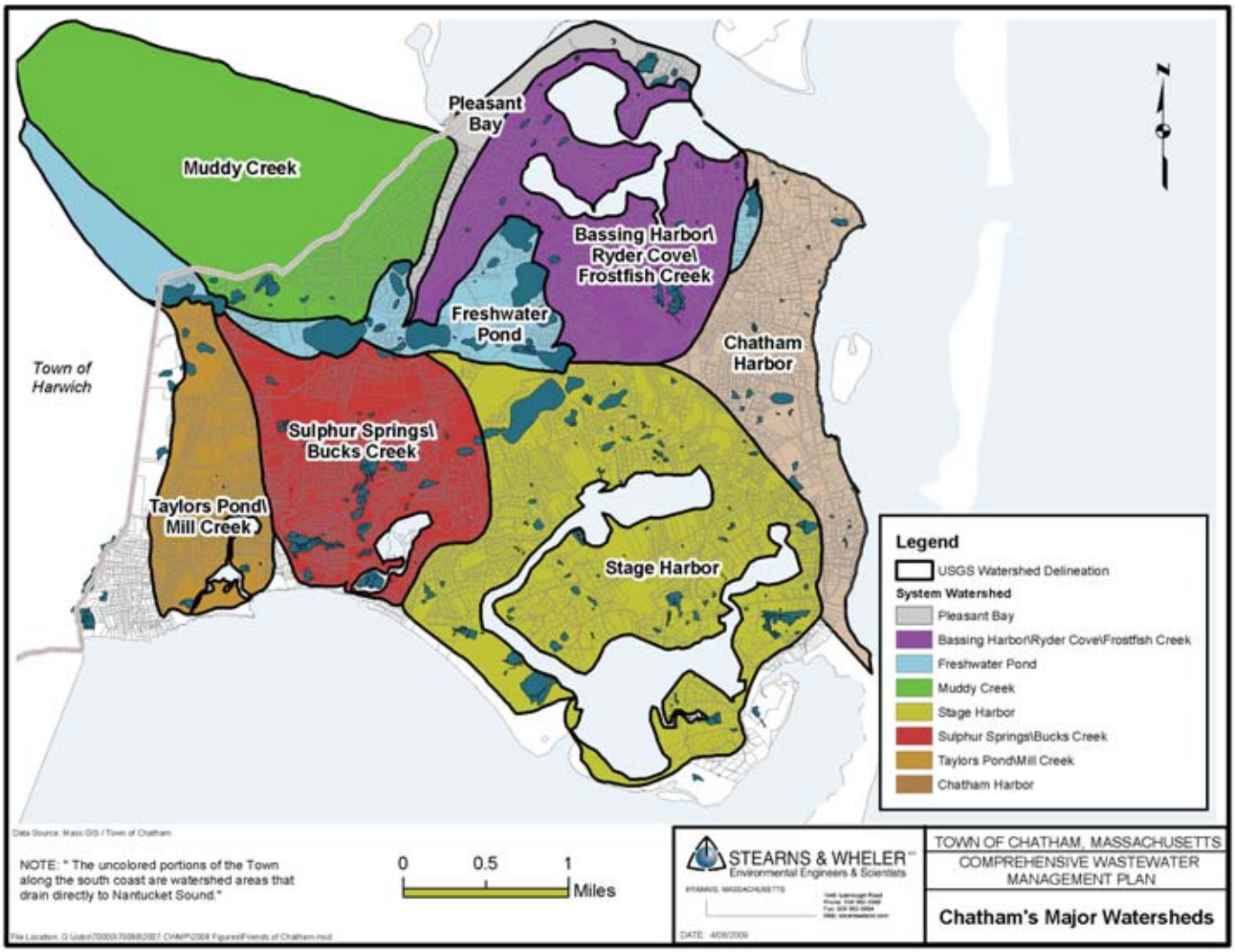
If 40 cups represented all the water in the world, all of it except for 1 cup would be found in the oceans. That one cup consists of the waters illustrated here.

Non-Ocean Waters of the World



Watersheds: Pathways to Our Waterways

Rain and snow falling on Chatham average 44 inches of fresh water each year. The precipitation either is absorbed by the plants and trees at the surface, percolates through the surface layers and recharges the aquifer, runs off the surface directly into our estuaries and ponds or evaporates back into the air. Other sources of recharge to the aquifer are septic systems and drainage from impervious surfaces. The ground water in the aquifer moves laterally out to our ponds and estuaries. Freshwater ponds, marshes and estuaries are destinations for all the ground and surface water flowing through each watershed. The watersheds associated with each estuary and freshwater pond are shown on the figure below. Locate your home on the map and trace the path your groundwater takes to the coastline.



Groundwater typically discharges into a pond on one side and the pond water recharges the lens on the other side. As groundwater flow reaches the coastline, it discharges directly into the estuary as fresh water seepage. Because of this interconnection, all uses of water – whether for drinking, swimming, boating, shellfishing, or finfishing – are dependent on maintaining the quality and quantity of water in the aquifer.

Barry Commoner's First Law of Ecology states that: "Everything is connected to everything else." What you do on your land may have widespread impact beyond the boundaries of your property.

We all live upstream!

Why Should We Care About Watersheds?

Water is the universal solvent. While dissolving essential minerals, it makes them available to the microscopic life that forms the base of aquatic food chains. Water also dissolves and carries pollutants into the ground and into our freshwater ponds, estuaries, and offshore waters. These pollutants range from the nitrogen and phosphorus in our septic systems and fertilizers, to gasoline additives and fecal matter in our storm water runoff.

You are part of the larger environment.

Even if you don't live right on the water, your everyday activities impact the water bodies in your watershed as nutrients and pollutants travel through runoff and groundwater. As the groundwater beneath your property makes its journey to our coastlines, it carries along your contributions in the form of nutrients or hazardous compounds.

Drawing by Kassie Foss

There are many ways to contaminate water . . .

How Does Discharge from a Watershed Affect the Ecosystems of our Waters?

Chatham relies on clean, productive and aesthetically pleasing waterways for tourism, recreational swimming, boating and commercial finfishing and shellfishing. There are two main types of pollution that are of concern for Chatham's waterways: nutrients and bacteria.

Drawing by Kassie Foss

Nutrients enable plant life to grow

Nitrogen Affects our Saltwater Embayments

In a saltwater pond or estuary, the marine plants at the base of the food chain require nutrients in order to grow and reproduce. The excessive supply of nutrients to an ecosystem is called eutrophication. In general, algal growth in salt water is stimulated by nitrogen. When a watershed supplies too much of the nutrient nitrogen:

- Microscopic phytoplankton (microalgae) increase dramatically, causing the water to become "cloudy" and, in extreme cases, green or brown.
- Slime algae increase on the surfaces of pilings, rocks, and eelgrass blades.
- Drift algae (macroalgae) grow to excess, break loose, and pile up onto the shore or eelgrass beds.

Eelgrass is a vital component of shallow estuaries. It is a rooted marine plant that provides habitat for bay scallops, blue crabs, tautog, winter flounder, and tomcod, among others. Because eelgrass is very sensitive to poor water quality and algal growth on its leaves, its decline is a warning bell that must be heeded.

Shellfish help to improve water quality as they feed by filtering microscopic particles from the water. One study has calculated that 100,000 rapidly growing oysters can cancel the nitrogen pollution from 27 people living in the watershed.

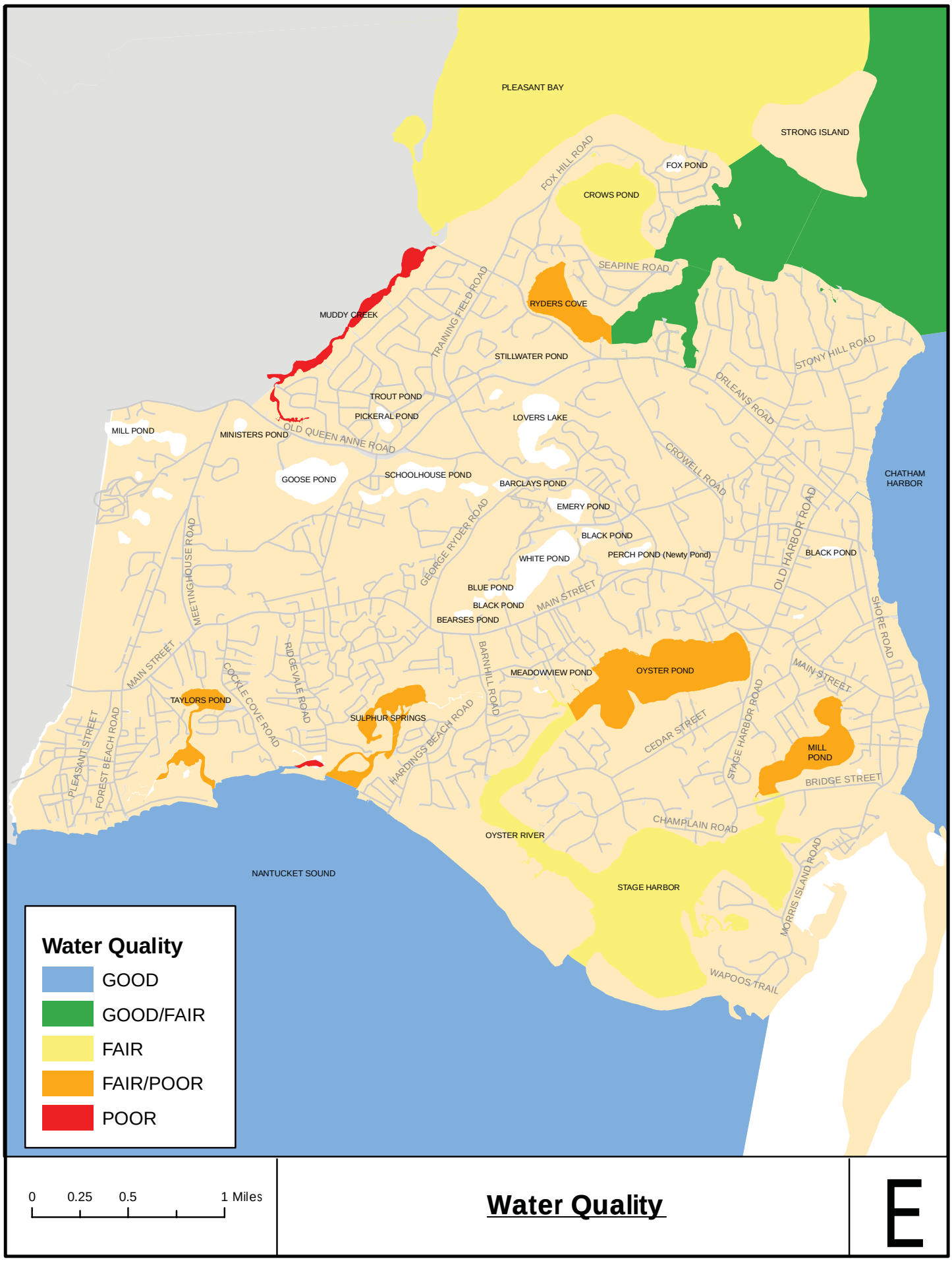
Fertilize Your Estuaries and Salt Ponds with Nitrogen Only if You Like Them Green!

The rampant growth of microscopic algae causes the green, murky look that makes salt ponds and sea water uninviting and ecologically unhealthy. This excess plant material, when it decomposes, takes oxygen out of the water, suffocating marine life. Algae blooms also reduce the amount of sunlight that can penetrate the water. Valuable marine plants like eelgrass cannot photosynthesize in cloudy water and soon die off. In the last decade, eelgrass meadows have disappeared from nearly all of Chatham's waters.

Chatham is blessed with many square miles of salt and brackish coastal ponds, marshes, bays, and harbors that are at risk from nutrient overloading. The water quality in every coastal waterway is affected by the addition of nitrogen from its watersheds.

Where Does Nitrogen Come From? Us!

The most significant source of nitrogen that we can control is human wastewater. Although your septic system removes about a quarter of the nitrogen present in urine, the wastewater that leaves your leaching field is still highly concentrated with nutrients – 100 times more concentrated than the desired levels of nitrogen in coastal waterways. For most of the estuaries, wastewater is the source of more than half the annual nitrogen input.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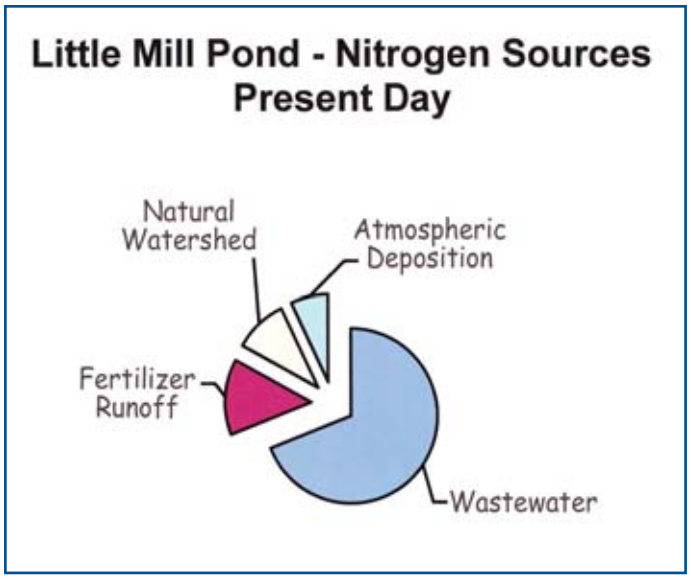
OYSTER RIVER
NANTUCKET SOUND
STAGE HARBOR
MORRIS ISLAND ROAD
WAPOOS TRAIL
Water Quality
GOOD
GOOD/FAIR
FAIR
FAIR/POOR
POOR
0
0.25
0.5
1 Miles
Water Quality
E

Another important source of nitrogen is the atmosphere, which is polluted by auto exhaust and smokestack emissions from power plants and heavy industry. These contaminants travel from as far away as the Midwest or as nearby as the local power plant. While atmospheric deposition may contribute up to 60% of the annual nitrogen pollution in an estuary, it is difficult for us to control.

Fertilizers used on lawns, gardens and golf courses are also sources of nitrogen. If too much is applied or if the ground is heavily irrigated after being fertilized, the nitrogen will dissolve in the water and travel beyond the reach of the grass roots and into the groundwater.

The breakdown of nitrogen sources for Little Mill Pond is typical of the proportions found in other Chatham embayments.



Water quality of estuaries due to nutrient loading has been assessed by the Chatham Water Watchers in support of the Massachusetts Estuaries Project. A simple summary of the data is shown in the Figure on the opposite page.

Phosphorus, Another Nutrient, Affects Our Freshwater Ponds

Protecting our ponds' water quality is of prime importance to maintain these ecosystems. Development and land use can impact the water quality by introducing pollutants from septic systems, lawns and storm-water discharges into the water or onto pond edges. In freshwater bodies, phosphorus is the critical nutrient. As phosphorus from various sources enters a freshwater system, plant growth is stimulated, and if excessive, eutrophication occurs.

Phosphorus sources include wastewater, street runoff, and soil erosion. Phosphorus has been removed from laundry detergents but is still found in many automatic dishwasher detergents. It is usually wastewater systems within a few hundred feet of the pond that are the primary phosphorus sources. Because phosphorus, unlike nitrogen, is actively bound up in the soil, the effects of phosphorus on freshwater systems can be minimized by setback requirements for septic systems. Establishment of natural vegetated buffers around pond shorelines is an important tool in protecting the water quality of our many ponds.

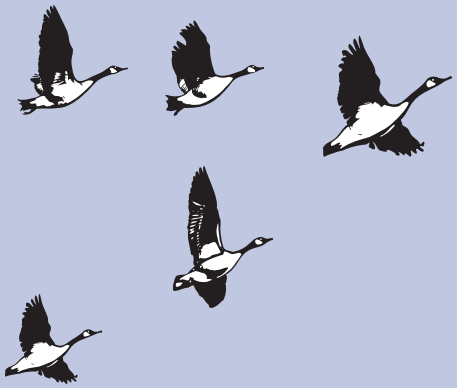
In 1998, the town's Water Quality Laboratory initiated a pond monitoring program. The intent of the program is to determine the current status of the major ponds in Chatham, provide data to support pond management initiatives, and to provide long-term monitoring. Though there is limited information concerning the water quality in the ponds, many are showing signs of impact to varying degree, with Lover's Lake and Stillwater Pond considered highly degraded. The program is focusing on the Great Ponds and Black Pond-east due to the proximity of the golf course.

Bacteria Are Harmful To Our Health

Bacterial contamination poses a constant threat to swimming areas and shellfish beds. Cockle Cove Creek has been closed to swimming for several years due to high bacterial readings, primarily from natural sources. The form of bacteria associated with beach closing is *enterrococci*, commonly found in the fecal material of warm-blooded animals, including humans. Most enterrococci bacteria is believed to enter water bodies via storm water runoff or from natural sources (wildlife/waterfowl) rather than septic systems.

Increased boating activities associated with accelerated growth has also contributed to local coastal pollution through sources such as outboard motor combustion, boat sewage discharge and fueling spills. Many of these discharges contain nitrogen and most include bacterial as well. Coastal waters have been degraded to the point where some shellfish areas are closed to shellfishing on a seasonal basis every year. These seasonal closures are most commonly the result of natural conditions, including increased water temperatures that prolong bacterial survival and increased wildlife/waterfowl activity. Examples of seasonal shellfish closures in Chatham include Bucks Creek, Mill Creek and Oyster Pond. Recent efforts to manage storm water runoff into Oyster Pond have resulted in the reopening of approximately 12 acres of the Pond, on a seasonal basis, that had been closed year-round since the mid 1980's.

WHY WE SHOULD NOT FEED WATERFOWL



- Feeding causes waterfowl to concentrate in unnaturally large flocks, interrupts migration patterns, and may create non-migratory, permanent flocks.
- The overpopulation of wild waterfowl may cause the closure of shellfish beds and swimming areas due to bacterial pollution from their droppings.
- Large bird populations are also a source of nutrient pollution to the ponds.
- Feeding waterfowl is prohibited by Chatham's Board of Health Regulations.

Cape Cod Neighbor

Drawing by Kassie Foss

The Horseshoe Crab:
A Survivor of Ancient Seas

The Atlantic Horseshoe Crab (*Limulus polyphemus*) is found in our estuaries and along coastal beaches. Harvest of these animals for bait is prohibited in Pleasant Bay and the Monomoy National Wildlife Refuge. Their blood cells are used to detect bacterial contaminants in pharmaceuticals and medical devices and their spanned eggs are an important food source for migrating shore birds. If you see a Horseshoe Crab on its back in the surf, to save them, "Just Flip 'Em Over."

OUR NATIVE AMERICAN HERITAGE

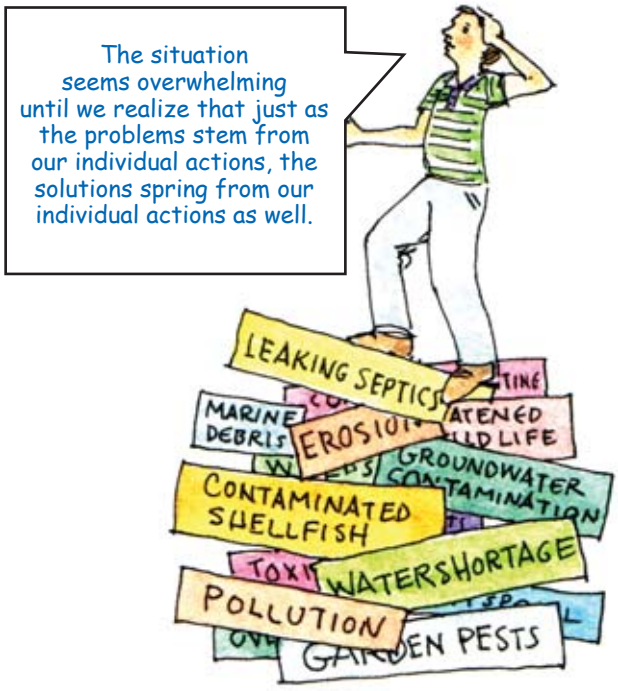
Very few Native Americans were left in Chatham by the time it was settled by Englishmen. Most had died from diseases contracted from the earlier explorers. For a while the settlers lived side by side with the natives, but the Monomoyicks left only faint echoes of their existence in present day Chatham. Part of their legacy is in words that linger to the present day, mostly names of persons and places. Monomoy is, of course named for Monomoit which was the original name of the Chatham area, but most present Native American words are street names, probably given long after the native population had died out. We do not know the meaning of the words in most cases.

Street names include:
Absegami, Cotchpinicut (named after an island in North Chatham explored by Champlain, now completely washed away), Menekish, Monomesset, Monomoit, Monomoyick, Nonuantum, Patuxet, Potonumecot, Quasson (may have been named for Mattaquason's son John Quason), Seaquanset, Tisquantum (the Native American name for Morris Island, now a street there), Wapoo, Wequasset, Wonkipit.

Other Wampanoag words:
Mattaquason, name of Monomoyick sachem from whom William Nickerson first bought land.
Quahog means "shut tight" in Wampanoag.

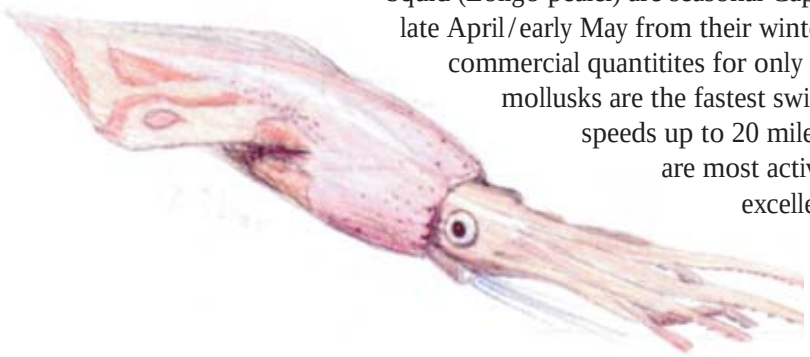
EARLY SETTLERS

William Nickerson of Yarmouth was the first Englishman to buy land in Chatham in 1656 through an agreement with the Monomoyick sachem Mattaquason. After much litigation with Plymouth Colony, he finally received deeds for his original purchase in 1672 and subsequently bought more, until he owned 4000 acres in Monomoit. Other settlers followed. Gradually the settlers cut down the forests of oaks, pines and walnuts for wood for farms and cleared the thickets of huge cedars for cranberry bogs. Apparently the few Native Americans left in the settlement lived near the saltwater, where they farmed and fished, and the English settlers lived near the freshwater ponds so they would have plenty of water for their cattle. They lived peacefully together, but the native population and culture slowly disappeared until there was only one full blooded Native American left on the Lower Cape. His name was Micah Rafe (or Ralph) and he died in 1816.



Cape Cod Neighbor

Squid: A Mollusk of a Different Color



Squid (Loligo pealei) are seasonal Cape visitors. They arrive in Chatham waters in late April/early May from their winter offshore home. They are caught in weirs in commercial quantitites for only one week in May in Nantucket Sound. These mollusks are the fastest swimmers in the invertebrate world, achieving speeds up to 20 miles an hour. Caught at night on jigs when they are most active, they are fished for bait, but also make excellent food. An effective predator and an elusive prey, squid can change colors and squirt ink to intimidate their enemies.

Cape Cod Neighbor

Herring: Swimming Against the Flow

Silver Herring (Alosa pseudoharengus), also known as alewives and Blueback Herring (*Alosa aestivalis*) spend much of their lives in the open ocean. They eat plankton and swim in large schools, covering great distances throughout the Atlantic. As anadromous fish (species that live most of their life in the ocean but return to spawn in fresh or brackish waters), these two herring species return each Spring to some of our freshwater ponds and streams. In Chatham, the only place to witness this mass migration is at the Ryder's Cove Herring Run to Stillwater Pond and Lovers Lake.

A Quick Start for the Water-Wise

Changing our behavior is tough. Start slowly; begin by incorporating three new actions into your daily life. Don't expect miracles overnight, but do expect miraculous change over time.

Choose one action that relates to conservation of water or reduction of waste.

Preventing pollution by conserving water and reducing waste is far cheaper than cleaning up pollutants afterwards. See Chapters 2 and 3 for more ideas.

Choose one action that relates to household hazardous waste.

Many of the products we use around the home find their way into our waters. So use the safest alternatives, suggested in Chapter 5.

Add new actions as your first choices become part of your daily life.

If you like to garden, choose an action from Chapters 7 and 8 on soil erosion and landscaping. If you're a boater, choose an action from Chapter 10, on good boating practices.

Ten Simple Things you Can Do Right Now to Begin Caring for our Local Waters.

Conserving water at home and in the office can reduce the volume treated by your septic system or sewage treatment plant

1.

Saving water is as important as keeping it clean. Chapter 3 and 4 offer many ideas about how to avoid wasting water.

Insulate your hot water heater, caulk or replace leaky windows, upgrade to Energy Star rated appliances, and insulate your home to reduce its energy demands.

2.

For a free energy audit and financial assistance information, contact the Cape Light Compact (800-797-6699).

Dispose of your hazardous wastes during special collection days rather than in your regular garbage pickup or down storm drains.

3.

For information about hazardous waste see Chapter 5. Call the Cape Cod Cooperative Extension Service or the Chatham Health Department for a schedule of collection days.

4.

Motor vehicles are the biggest contributor to air pollution and one of the biggest to water pollution. Plan ahead to do several errands in one trip. Car-pool or use public transportation whenever possible. Encourage our local transit authority to meet your needs.

Use your car less!

Recycle used motor oil.

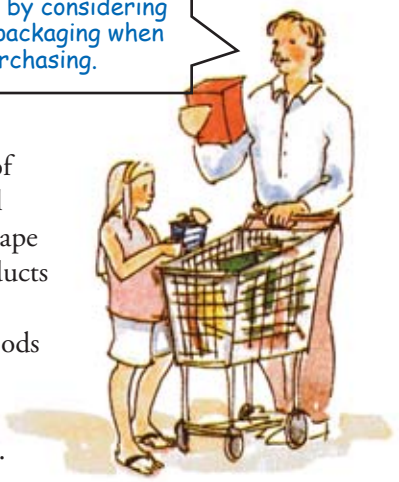
5.

One gallon of oil can foul one million gallons of freshwater. That's a year's water supply for 30 people! There are only two ways to safely dispose of waste oil: return it to the place you bought it (along with the receipt), or bring it to the hazardous waste collection site at the transfer station.

Pre-cycle by considering product packaging when purchasing.

6.

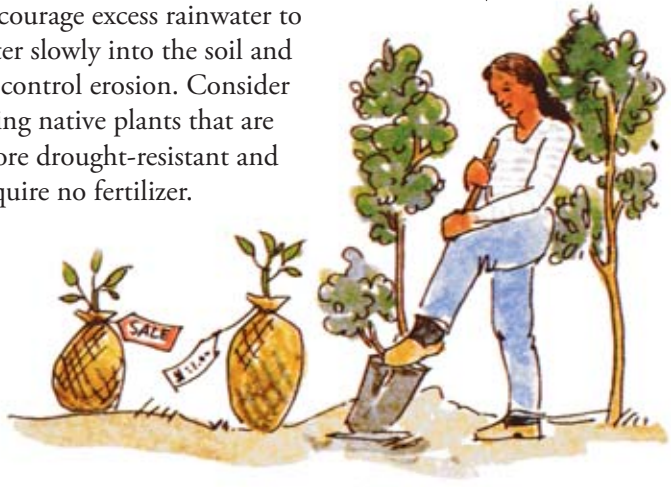
Packaging makes up 33% of our houshold waste, and all of it must be shipped off-Cape for disposal. Look for products with limited, recycled, or reusable packaging. Buy foods in glass and aluminum containers. See Chapter 6 on recycling for more hints.



Preserve the established trees around your home and in your neighborhood.

7.

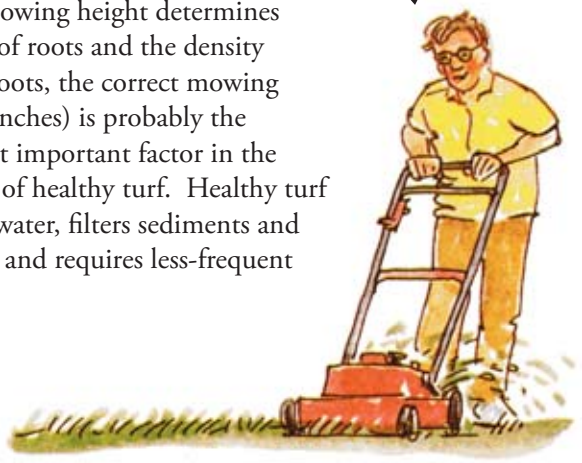
Plant new trees and shrubs to encourage excess rainwater to filter slowly into the soil and to control erosion. Consider using native plants that are more drought-resistant and require no fertilizer.



Reduce runoff from lawns by properly adjusting your lawn mower. and herbicides.

8.

Because mowing height determines the depth of roots and the density of grass shoots, the correct mowing height (3 inches) is probably the single most important factor in the formation of healthy turf. Healthy turf holds rainwater, filters sediments and chemicals, and requires less-frequent watering



Eliminate your use of lawn fertilizers, pesticides, and herbicides.

9.

You can have a healthy lawn and a beautiful garden without using toxic chemicals. Refer to Chapter 8 on landscaping and Chapter 9 on lawn care for sound gardening and pest control tips.

Rinse and scrub your boat hull and decks with a brush instead of using soap. You will be helping to keep our waters clean.

10.

If your boat is stained, use phosphate-free soap or any of the alternatives listed in Chapter 5 on Hazardous Waste. See Chapter 10 on boating for more hints.

Chapter 3

Water, Water Everywhere

Sound Water Use

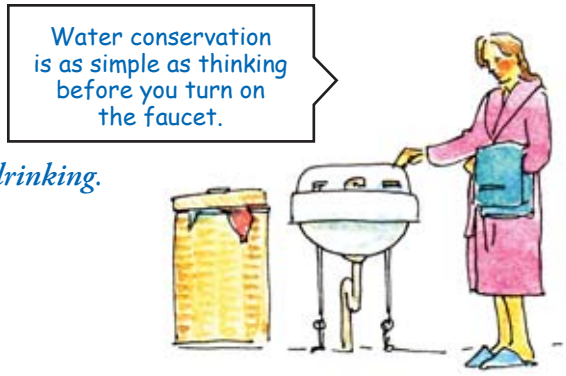
Most of the Earth's water is not readily available for human use; 97% forms our oceans and 2% is frozen. We depend on the remaining 1% which is contained in streams, rivers, ponds, and in the groundwater.

Saving water is as important as keeping it clean.

The Cape's water comes from its aquifer. Although the population grows and the need for services increases, the capacity of the aquifer remains finite. Yet we expect clean, clear water for drinking, irrigating our crops, and allowing fish and wildlife habitats to thrive.

Using less water saves more than just the water; it also saves you money. Conserving water helps protect our ponds by reducing the demand on septic systems and sewage treatment plants. If your sewage treatment and maintenance costs are based on water consumption, water conservation can save you even more money. And saving hot water also means saving energy.

Every day, each person who is not already conserving water uses about 65 gallons of water at home. How much of this do you actually drink? Most of us can decrease water consumption in our homes by 15% to 20% without much discomfort or expense. All we have to do is acquire good water-use habits.



Less than 1% of the Earth's water is available for drinking.

Here are some tips to get you started...

Check for leaks. Check your water meter or your well pump while no water is being used. If the dial moves, or if the pump comes on, you have a leak. **A hole in your water line 1/32 of an inch in size wastes 750 gallons of water a day.**

Install low-flow faucet aerators. Your water pressure will seem stronger, but you'll actually be saving water while reducing flow as much as 50%.

...in the bathroom

- **Check toilets for leaks** by adding food coloring to the toilet tank. If color appears in the bowl, without flushing, there is a leak. A leaking toilet can waste 200 gallons of water a day without making a sound.
- **Flush only when necessary.** Each flush in older toilets uses about 6 gallons of water. Never use the toilet as a wastebasket.
- **For older toilets,** try filling one or two half-gallon plastic bottles and placing them in your tank to reduce water used for each flush. Or consider replacing the old one with a new, lower flow toilet which only uses 1-1/2 gallons per flush.

- **A shower or a bath?** Only the shortest shower saves more water than a partially filled tub. A full tub, however, can use 30-50 gallons of water: more than a short shower. Consider bathing small children together.
- **Install water-saving shower heads** or flow restrictors. Shower heads with an on/off valve are also available, allowing the water flow to be stopped and restarted without readjusting the temperature.
- **Don't let the water run** in the sink while shaving, brushing your teeth, or lathering your face and hands.

...in the kitchen

- **Fill your dishwasher.** Only use it when you have a full load. Use the cycles with the least number of washes and rinses. Buy detergents with zero phosphates.
- **Avoid running water** continuously when washing dishes in the sink. If possible, use two dishpans when washing dishes by hand: one to wash and one to rinse.
- **Wash dishes once a day.**
- **Keep a bottle** of drinking water in the refrigerator to avoid running the tap to get a glass of cool water.

- **Fill your washing machine.** Pre-soak clothes only when absolutely necessary. Set the water control level appropriately. Permanent press cycles may use an extra 10-20 gallons of water.
- **Buy a front loading washing machine** when you replace your present machine; it saves water and energy.
- **Avoid garbage disposals.** Many local towns prohibit garbage disposals because they use a great deal of water and can add grease and solids to your already hard-working sewage and septic systems.

...outdoors

- **Lawns – the Cape Cod way.** Plush, green lawns are not the norm here, and for good reason: they require too much water and fertilizer. It's better to decrease the size of your lawn and landscape with native, drought-resistant plants.
- **Water your garden only when necessary.** Water only in the early morning or at night to avoid rapid evaporation. Keep in mind that watering the sidewalk and street wastes water.
- **Use a broom, not a hose,** when cleaning driveways and walkways.

- **Water root areas of your plants,** preferably with a drip irrigation system which can save up to 60% over other watering techniques.
- **Wash your car only when necessary**, with a bucket and a hose with a shut-off nozzle. Use a high-pressure, low volume nozzle that has a pistol-grip.
- **Locate and label the master water supply valve** for ease of response in case of a major leak or broken pipe. Consider turning off your water and hot water heater when going on a trip.

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The Chatham Water Department offers free information booklets.

See Chapters 8 and 9 on landscaping and lawns for more ideas

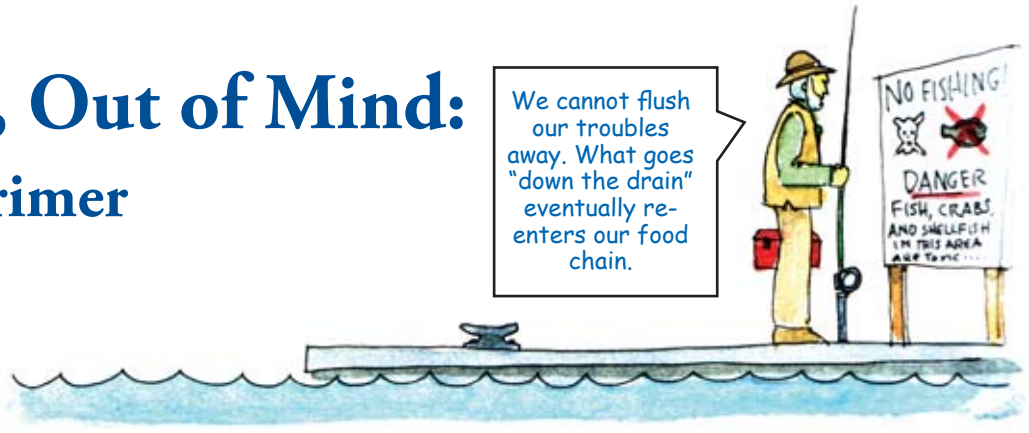
Cape Cod Neighbor

Eelgrass: Lean and Green

Eelgrass is often mistaken for a seaweed. Unlike seaweed, it has roots and even flowers underwater. One of the most important roles of eelgrass is to provide underwater shelter for species of fish and shellfish, especially bay scallops. Young scallops that attach themselves to the eelgrass leaves are less vulnerable to bottom predators like crabs and starfish. When eelgrass washes up on the beach, its brown piles provide cover for the small invertebrates that nourish wandering shorebirds. Decreased scallop populations followed the decline of eelgrass beds in the 1930s. While eelgrass populations have increased since then, they are now declining again due to poor water quality.

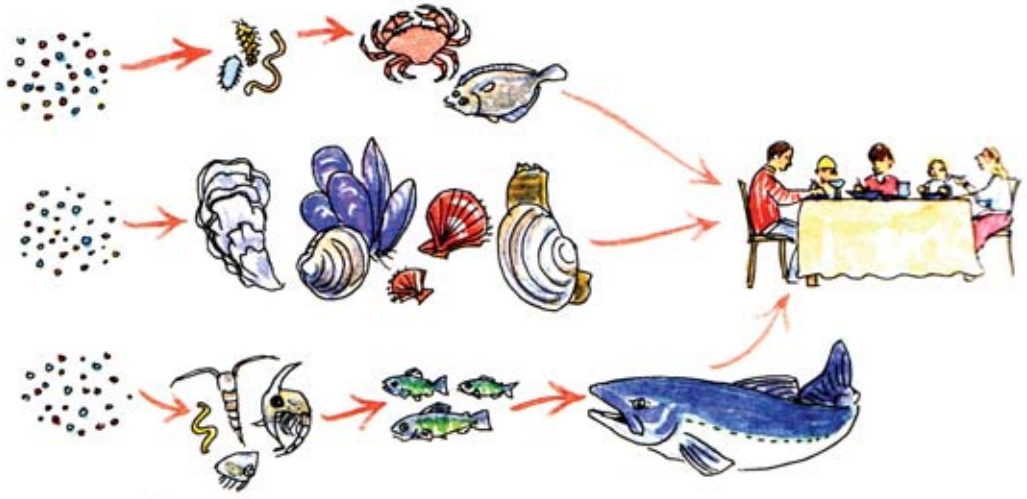
Chapter 4

Out of Sight, Out of Mind:
A Wastewater Primer



Human wastes carry viruses, bacteria, antibiotics, and nutrients and must be disposed of with care. These bacteria are not suited to survive for long outside the human body; however, the viruses and nutrients can persist. If not carefully disposed of, wastes can contaminate drinking water. The nutrients contained in wastewater, especially nitrogen, can also affect the quality of drinking water and cause a serious decline in coastal marine habitat, wiping out eelgrass and shellfish beds.

Toxic materials, including prescriptions, should never be disposed of in your septic system. They may seep into the groundwater, contaminating drinking water and the food chain.



Wastewater Treatment: A Brief History

Historically, the goal of treatment is to remove the disease-causing pathogens and dissolve the solids enough to be able to dispose of the wastewater in the soil. Human beings have a long history of disposing of their wastes into the ground. This method isolated wastes and allowed natural chemical and biological processes to break down solids and destroy the pathogens. But this only worked as long as the population remained small. The addition of clean water to carry the waste out of the dwelling and into cesspools was a natural next step. However, the water also leached nutrients, viruses, and to a lesser extent, bacteria away from the cesspool, and toward the water sources.

Modern wastewater systems contain two components: the tank and the soil absorption field. The septic tank was a step forward from the cesspool because it provided a watertight tank to store the solid wastes and release the liquid slowly to infiltrate into the ground. Separating the solids from the liquids is called primary treatment. It helped prolong the life of the soil absorption system by removing grease and solids that once clogged the soil around cesspools.

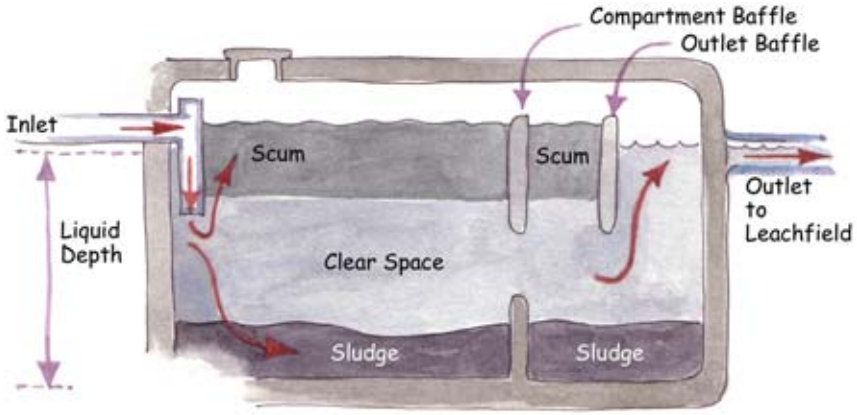
Eventually many densely settled areas needed wastewater management. Wastewater was collected and piped to a facility that separated the solids from the liquids, killed almost all of the human waste bacteria, while using other bacteria to further digest the waste, and released a clear effluent into the ground. This process is known as secondary treatment. Chatham chose that route when we built our Wastewater Treatment Plant off Sam Ryder Road. Chatham's only sewered area is the downtown area and along Crowell Road to serve Chatham's middle and high schools. In the rest of town, private and commercial users have underground septic systems on site. The septic tank contents, pumped from Chatham septic systems, are brought to one of several municipal septage treatment facilities in Barnstable, Chatham, Orleans or Yarmouth that treat the solids from our systems. The treated residue is pumped to huge leaching fields where it flows through the groundwater, eventually ending up in Nantucket Sound or Cape Cod Bay.

Backyard disposal: The septic system and how it works

The septic system is an adequate disposal technique where housing density is low and groundwater does not carry the dissolved contaminants into bays and ponds.

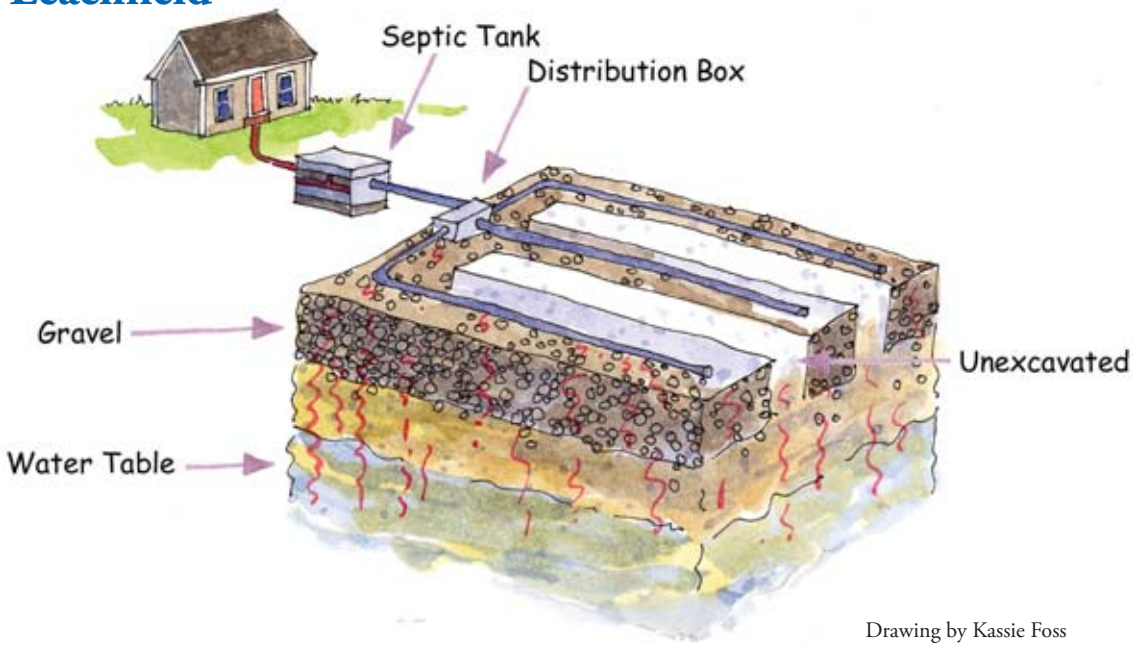
However, septic systems are still used by the vast majority of homes in the region even though population densities are increasing. Newer systems consist of the tank – a cement or fiberglass container with a T-shaped outlet pipe that keeps the floating grease layer in the tank – and a soil absorption system that infiltrates the liquid portion of the wastes into the ground. Older systems, cesspools and leach pits perform similar functions. The Board of Health oversees these systems and enforces the State sanitary regulations under Title 5, as well as local regulations.

Typical Septic Tank



Of the approximate 6,700 housing units surrounding our waters, the vast majority utilize backyard wastewater systems. Chatham residents and businesses release well over 1,000,000 gallons of wastewater into the environment each day.

Septic Leachfield



Drawing by Kassie Foss

Septic system leach fields effectively eliminate almost all bacteria and many viruses. The effluent leaving the tank contains tens of thousands of fecal bacteria, but after percolating through four feet of soil, the bacterial count is reduced to one per gram of soil. Nutrients like nitrogen are not completely removed during their transit through a typical septic system. So they proceed into the groundwater and eventually into the coastal waters. The septic system serving a family of three releases enough nitrogen to contaminate hundreds of gallons of marine water on a daily basis.

Excess nitrogen entering a salt pond or bay in the form of nitrate leads to:

- Phytoplankton blooms, causing cloudy or greenish coloring
- Excess growth of macro algae, sea lettuce
- Decline or outright loss of eelgrass beds.
- Increase in decayed plant material at bottom
- Decrease of shellfish like scallops and soft-shell clams.
- Odors from decay of excess vegetation. As the density of housing development increases, so does the risk of nitrates contaminating nearby wells.

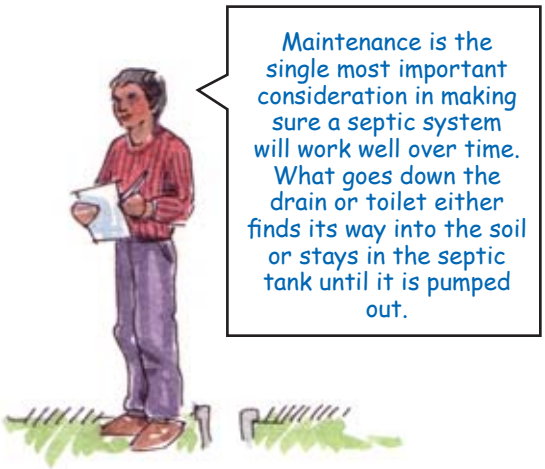
Excess phosphorous (phosphates) from household wastewater joins the groundwater and flows to our freshwater lakes and ponds where it stimulates:

- Plant growth
- Depletion of oxygen
- Decay at the bottom

As the density of housing development increases, so does the risk of nitrates and phosphates contaminating nearby Town and private wells.

Take Care of your Septic System:

- **Have it pumped out regularly:** The system should be pumped regularly to remove the sludge and the floating scum. The frequency depends on how you use your system and what goes down the drain. All systems should be pumped every three to five years to avoid septic system failure.
- **Conserve water:** Reducing the flow through your system will reduce the movement of solids and scum into the soil absorption system.
- **Don't overload the system:** A dripping faucet or a leaky toilet can add hundreds of gallons of water to the system each week. If you are going to have a large gathering, rent a portable toilet to reduce the demand on your septic system. Stagger your washing machine and dishwasher use to spread out the flow.
- **Don't install or use a garbage disposal:** These devices add large amounts of grease and organic matter to the system and will shorten the life of your soil absorption field.



- **Don't kill the bugs:** Flushing chemicals down the drain can kill bacteria in your septic tank. When these bacteria stop working, the sludge accumulates and is more likely to escape the tank and clog your leaching system.
- **Don't flood the soil absorption system:** Roof drains and stormwater runoff should be diverted away from your system to prevent periodic flooding.
- **Don't compact the soil absorption area:** Don't park your car on or drive over the system. The compaction of the soil from the weight of the vehicle will reduce the system's capacity.
- **Compost it:** Don't use the sink as a garbage disposal. This will add solids and grease to the tank that may exceed the ability of the bacteria to digest it. Compost what you can and dispose of greasy waste in your regular trash.
- **Don't flood the system with Hot Tub water:** Releasing a large volume of hot, chlorinated water into the septic system will kill the bacteria that are busily breaking down the waste. If you must drain your hot tub or spa, allow several days for the water to cool and the chlorine levels to dissipate and then slowly drain it onto the ground in a manner that will not impact your neighbors or natural resources (i.e., don't drain into wetlands).

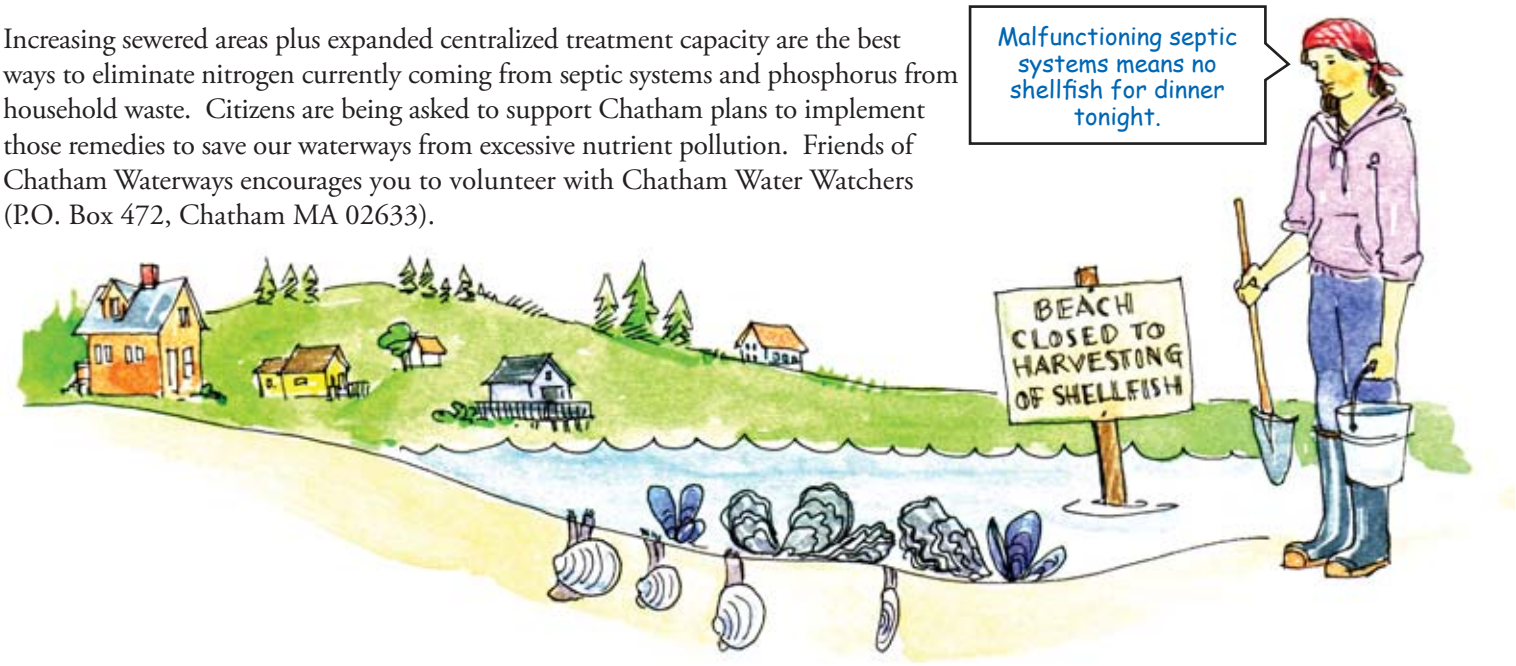
A septic system pump-out and sludge disposal usually costs a few hundred dollars. Replacing a septic system may cost well over $20,000!

Advancing Beyond the Septic System

Excessive nutrients flowing from septic systems in our densely populated town have led to significant decreases in water quality in Chatham. With guidance from the Chatham Department of Health and Environment and coordination by Friends of Chatham Waterways, over 150 volunteers have tested and sampled our water quality for eleven years at 25 stations in Chatham's saltwater estuaries. Data gathered by Chatham Water Watchers, our water-quality monitors, has been used by Massachusetts authorities to determine the amount of nitrogen that must be removed from each estuary to restore ecosystem health. At the same time, our freshwater lakes and ponds have been tested to determine where phosphorus levels must be reduced to restore their health. Chatham relies on clean, productive, and aesthetically pleasing waterways for tourism, recreational swimming, fish and boating, as well as for commercial and recreational fishing and shellfishing. Failure to reduce and then control nitrogen loads will result in replacement of highly productive eelgrass habitats with algae that smothers the bottoms of water bodies, reduces dissolved oxygen concentrations, causes fish kills, and widespread occurrence of unpleasant odors and scum. These environmental impacts greatly reduce commercial and recreational use of our bays and coastal waters.

The Federal Clean Water Act mandates that we clean up this form of pollution of our waterways. The Massachusetts DEP and EPA have issued mandates for the amount of nitrogen that must be removed from each of Chatham's embayments and salt ponds. The Town recently completed a town-wide Comprehensive Wastewater Management Plan (available on the Town's website) that details the problems, evaluates alternatives, and recommends a cost-effective, environmentally sound solution.

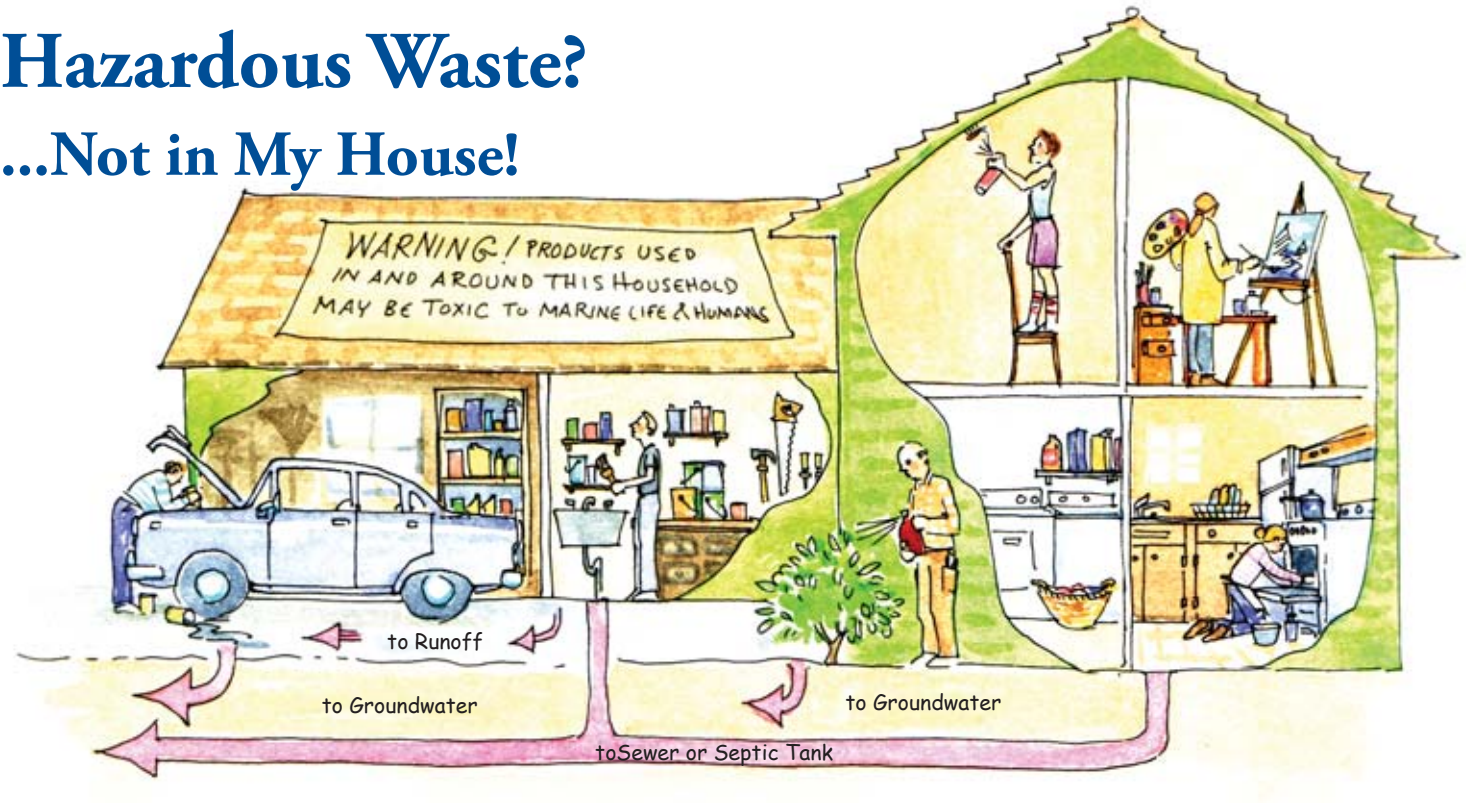
Increasing sewered areas plus expanded centralized treatment capacity are the best ways to eliminate nitrogen currently coming from septic systems and phosphorus from household waste. Citizens are being asked to support Chatham plans to implement those remedies to save our waterways from excessive nutrient pollution. Friends of Chatham Waterways encourages you to volunteer with Chatham Water Watchers (P.O. Box 472, Chatham MA 02633).



Chapter 5

Hazardous Waste?

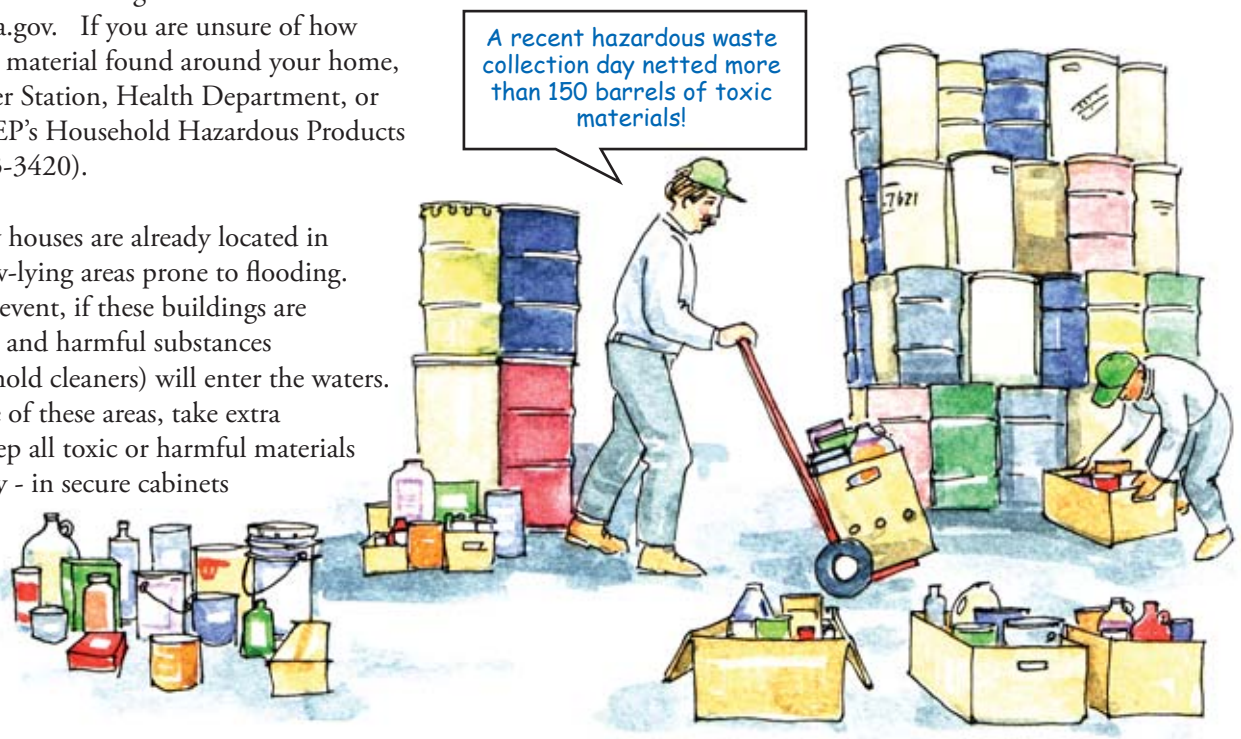
...Not in My House!



Thousands of common household products contain toxic ingredients that should be kept out of our waters. If we bring hazardous products into our homes, it is our responsibility to use, store, and dispose of them safely.

Never pour toxic materials down your drain. They will flow into your septic tank where they can destroy essential bacteria and pass into the groundwater that supplies our drinking water. If buried in the ground or dumped into storm drains, the toxins may flow straight into our creeks, ponds or bays.

To help us dispose of these substances, Chatham and Harwich jointly hold household hazardous waste collection days several times a year. Waste is then shipped off-Cape to an approved disposal site. Inquire at the Transfer Station (508-945-5156) for scheduled collection dates or go online to www.chatham-ma.gov. If you are unsure of how to dispose of any material found around your home, phone the Transfer Station, Health Department, or Massachusetts DEP's Household Hazardous Products Hotline (800-343-3420).

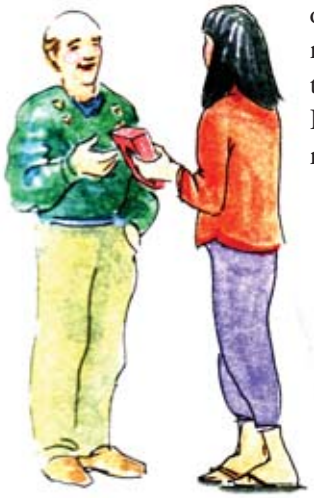


Remember, many houses are already located in flood zones or low-lying areas prone to flooding. In a major storm event, if these buildings are flooded, the toxic and harmful substances (including household cleaners) will enter the waters. If you live in one of these areas, take extra precautions to keep all toxic or harmful materials out of harm's way - in secure cabinets high above any potential floodwaters.

Household Cleaners

Most soaps and detergents are meant to be washed down the drain. They are biodegradable and, if the wastewater from your home is properly treated, they pose no problem to the environment. Other household cleaners are a different story. Most drain openers, oven and toilet bowl cleaners, and bleach are poisonous. Furniture polish and spot removers are flammable, and ammonia-based cleansers and disinfectants contain strong chemicals which may be harmful.

Read the labels of products in your cleaning closet. Do they contain such toxic components as *lye, phenols, petroleum distillates, chloride and dichlorobenzene*? Note also the words *danger, warning, toxic, corrosive, flammable, or poison*. These identify products that may contain hazardous materials.



Use and store these substances carefully. Keep them in their original containers. Do not remove their labels. Never mix them with other products. Incompatible products might react, ignite, or explode.

Corroding containers require special handling. Call your town's board of health or Fire Department for instructions on transporting these safely to a hazardous waste disposal site.

Chlorine is such a common ingredient in household cleaners that many people are surprised to learn that it is highly toxic. Chlorine is corrosive and a strong irritant to the lungs and mucous membranes. Chlorine-based cleaning products can also destroy essential bacteria in septic tanks, eventually causing system failures. Chlorine can also combine with other materials present in the home and environment to form new toxic substances. NEVER mix chlorine (or products that contain chlorine) with ammonia products; the resulting chemical reaction creates a poisonous gas that can be fatal.

Phosphates may boost cleaning power but, in bodies of fresh water, they act as a fertilizer, stimulating excessive plant growth. Ultimately this growth reduces oxygen available to support other aquatic life forms. Laundry detergents are now required to be phosphate-free. Currently dishwasher detergents are not required to be phosphate-free but some are. As of July 1, 2010, automatic dishwashing detergents sold for household use in Massachusetts are to contain only trace amounts of phosphates. Until then, read labels and buy only phosphate-free detergents.

Fluorescent whitening agents, also known as optical brighteners, are ultraviolet dyes contained in many laundry detergents that make fabrics seem brighter and whiter. These brighteners are toxic to fish and other aquatic life and are extremely slow to biodegrade. Laundry product manufacturers are not required to list individual ingredients, so choose one that does not boast a brightening feature.

Disposal

Avoid dumping cleaners or wash water down your drain. Instead dilute well with water and toss onto a gravel driveway or around deep-rooted plants to be absorbed slowly. If you must put it down the drain, flush with PLENTY of water. Then start fresh with a nontoxic, inexpensive alternative. For more suggestions on disposal, call the Massachusetts DEP Household Hazardous Products Hotline.

Solvents and Paints

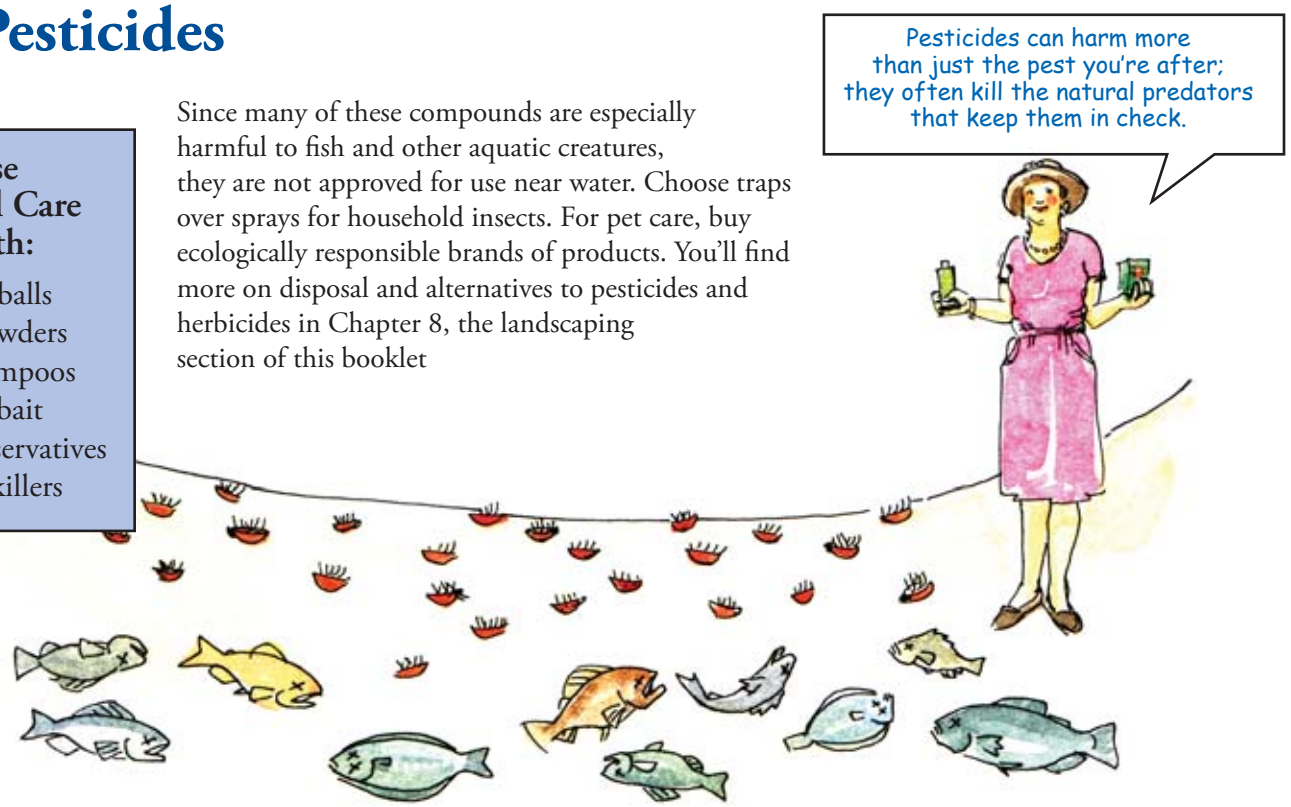
Oil-based paints and preservatives, paint thinners and removers, rust removers, furniture strippers and even nail polish and polish remover are highly toxic to aquatic life and can contaminate groundwater.

Herbicides and Pesticides

Use Special Care With:

mothballs
flea powders
pet shampoos
slug bait
wood preservatives
weed killers

Since many of these compounds are especially harmful to fish and other aquatic creatures, they are not approved for use near water. Choose traps over sprays for household insects. For pet care, buy ecologically responsible brands of products. You'll find more on disposal and alternatives to pesticides and herbicides in Chapter 8, the landscaping section of this booklet



Disposal

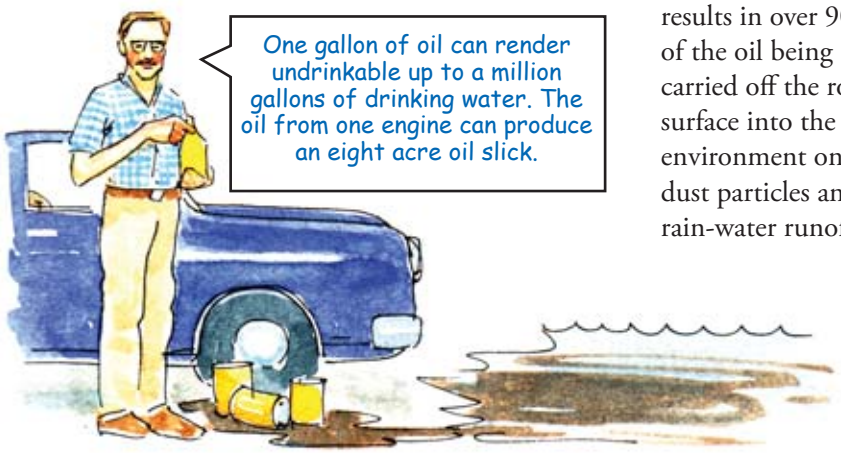
Solvents and oil-based paints should never be incinerated or put down any drain, sewer or septic system. Bring oil-based paint to a hazardous waste collection or use it up on a basement wall or inside a closet. Give away partly filled cans - they make a good freebie at garage sales! To dispose of latex paints, just take the lid off the can and let the liquid evaporate, or fill it with kitty litter and put the dried solids in your regular trash. You can also dry it by painting a piece of plywood, and peeling it off and disposing of dried paint; latex paint can go in the regular garbage, but oil-based should go to the hazardous waste collection. Set aside used paint thinner in a closed jar until the paint particles settle out, then pour off the clear liquid and reuse. When the remaining paint sludge is dry, wrap it in plastic for hazardous waste disposal. The Chatham Transfer Station accepts paints at the Paint Shed. For scheduled dates, inquire at the Transfer Station or at www. chatham-ma.gov.

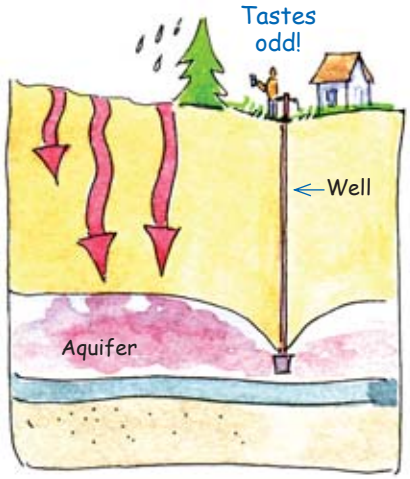
Alternatives

Choose latex paints instead of oil-based. Latex cleans up with soap and water and does not require thinner. Use whitewash – a nontoxic mixture of limestone, milk, and linseed oil – for fences, barns and basements. Buy unused paint from garage sales. Use a citrus-based solvent to clean up oil paint and brushes. Look for citrus-based removers. They work well without the fumes and don't require hazardous waste disposal.

Car Care Products

Our vehicles require a lot of toxic chemicals to run and to be maintained; nontoxic alternatives are far in the future. **Never dispose of these substances yourself.** When these fluids are poured on the ground or down storm drains they flow directly into our waters. When put into the trash, they can contaminate groundwater. The archaic practice of applying oil to dirt roads for dust control results in over 90% of the oil being carried off the road surface into the environment on dust particles and rain-water runoff.





Keep your car and other motorized equipment in good running order. Fix leaks promptly When washing or servicing your car, park on grass or gravel. Use soap and water rather than detergents, and use a bucket or pistol-grip nozzle to minimize runoff into storm drains.

Disposal

Store your car care products - separately, not mixed - in sturdy, lidded containers, out of the reach of children. Dispose of them at a hazardous waste collection. Return used car batteries to the Chatham Transfer Station. Waste oil can be disposed of at the Chatham Transfer Station. Call the State EPA motor oil info line for more information.

Other Car Care Products

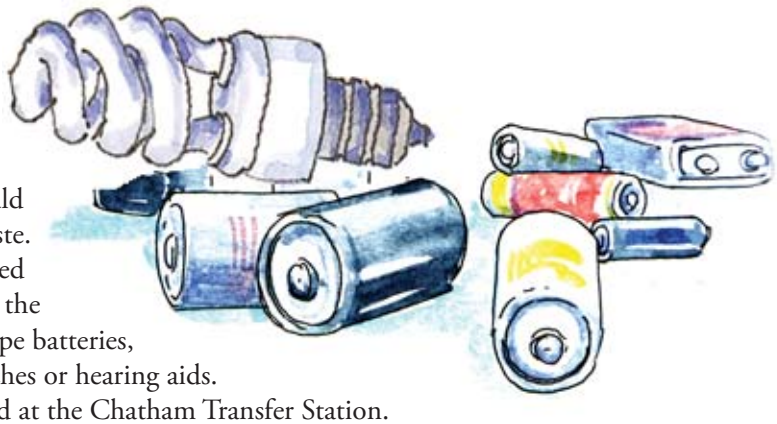
Treat antifreeze as hazardous waste. It contains ethylene glycol, which is poisonous to wildlife and people. Many cats and dogs have died after drinking the sweet-tasting puddles of antifreeze left on driveways. Buy an ecologically responsible brand for your car and boat. Winterize your plumbing with "plumber's antifreeze." It is made with propylene glycol and is non-toxic to your septic system.

Use Special Care With:

antifreeze
battery acid
brake fluid
degreasers
engine cleaners
gasoline and diesel
liquid car wax
motor oil
radiator flushes
rust preventatives

Items That Contain Heavy Metal

Use Special Care With:
computers
home thermometers
smoke detectors
televisions
energy-saving bulbs
fluorescent bulbs
mercury thermometers



Many common items in our homes contain heavy metals like mercury, cadmium, arsenic, and lead. These metals are dangerous, particularly to fetuses and children. They should also be treated as hazardous waste. Alkaline batteries can be disposed of in your regular trash but not the rechargeable or small button-type batteries, for example, those used in watches or hearing aids. Bring them to the Mercury shed at the Chatham Transfer Station. Contact the National Recycling Technology Project for information on recycling your computer and other electronic equipment. Also, you can easily recycle your empty printer cartridges at your local office supply store or use the postpaid envelopes available at the Post Office. Your local office supply store may also accept old printers, computers, monitors, laptops, and fax machines.

Above ground oil tanks are also a threat to groundwater. These tanks rust from the inside. Every year many tanks fail and leak into the underlying soil and groundwater. The costs of cleanups are staggering. If your tank shows signs of corrosion or is over twenty years old, it should be replaced with a new, safer stainless steel tank.

Taking Action

Become informed! Our household activities have a serious impact on water quality. Many of the products we find in our home are toxic, and the list keeps growing as more research is done.

- Read labels so you know what you are buying and what the potential hazards are.
- Follow the directions on the label.
- Use the least toxic product you can find and buy only what you need.
- Never use more of the product than the manufacturer recommends.
- Dispose of your unwanted household hazardous materials properly. Check at the Chatham Transfer Station for alternative means or hazardous waste collection days.
- Don't flush medications down the toilet. Take unused medications out of their containers, mix with used cat litter or coffee grounds, and throw them in the regular trash.
- Use alternatives (see following page).

And Last . . . Consider walking, bicycling, car pooling, or taking the Cape's public transportation system.

Alternative Water-Kind Cleansers for your Home

"Make Your Own Non-Toxic Cleaning Kit!"

Assemble a few spray bottles, empty jars, and the basic ingredients: baking soda (for scouring and deodorizing), white vinegar (removes mildew, odors, bacteria, and scale from hard water), borax and washing soda (degreases, cleans), citrus solvent (cleans oils and grease, some stains), lemon juice (removes gums, tarnish and dirt), and lemon and tea tree oil (disinfectant). Any of the above ingredients can be safely mixed together. Label clearly and store out of the reach of children.

Note: There are also many non-toxic commercial cleaners available on the market made with these same ingredients.

All Purpose Cleanser: Mix 1/4 cup white vinegar, 2 tsp borax and 1-2 tsp tea tree oil or lemon in 1 quart spray bottle of very hot water. Shake vigorously. Add more borax for disinfecting.

Bleach: Use oxygen bleaches, borax, or let the sun bleach your fabrics on an outdoor clothesline. Also try an old-fashioned bluing product to whiten whites.

Carpet Stains: Immediately apply club soda or equal parts white vinegar and water, blot dry, repeat, then clean with a brush or sponge using warm soapy water.

Deodorizers: In your refrigerator and other closed spaces, use an open box of baking soda. Sprinkle it on carpets and upholstery, wait 15 minutes, then vacuum. Simmer cinnamon and cloves, or place white vinegar in open dishes.

Drain Cleaners: Instead of chemical cleaners, use a plunger or a plumber's "snake." Then add 1/4 cup baking soda followed by 1/4 cup vinegar. Wait 15 minutes, and rinse with 2 quarts of boiling water. **Caution: do not use this method after trying a commercial drain opener – the vinegar can react with the chemicals to create dangerous fumes.**

Dusting: Use 1/4 cup white vinegar per quart of water and apply with a tightly wrung soft cloth, or use a micro-fiber dusting cloth.

Floor Cleaner: Add 1/4 cup baking soda and 1/4 cup borax to hot mop water; rinse with 1/2 cup white vinegar in clear water. For vinyl floors, simply add 1 cup vinegar to mop water.

Glass Cleaner: Mix 2 Tbsp vinegar and 2 tsp lemon juice and 1 tsp liquid soap in 1 quart warm water. Shake well, spray on, then buff with crumpled newspapers.

Metal Polish: *Silver:* Line a pan with aluminum foil and fill with water; add 2 tsp each of baking soda and salt. Bring to a boil and immerse silver. Polish with soft cloth. *Brass or Bronze:* polish with a soft cloth dipped in a lemon juice and baking soda solution. *Copper:* soak a cotton rag in a pint of boiling water with 1 Tbsp salt and 1 cup white vinegar. Apply to copper while hot; let cool, then wipe clean.

Mildew Remover: Make a solution with 1/2 cup vinegar, 1/2 cup borax and 1 quart of very hot water. Spray on and leave for 10 minutes. Wipe clean. Or add 2 tsp tea tree oil in 2 cups hot water in a spray bottle, shake to blend, and spray on problem areas. Do not rinse. For grout, mix one part hydrogen peroxide (3%) with two parts water in a spray bottle and spray on mold. Wait at least one hour before rinsing.

Paint Brush Cleaner: For oil-based paints, use citrus-based solvents available commercially.

Scouring Powder: Make a paste of baking soda and vinegar. Rub gently.

Toilet Bowl Cleaner: Mix 1/4 cup baking soda and 1/2 cup vinegar, pour into bowl, let stand, and brush well.

Wood Polish: Rub with 1 Tbsp of lemon oil mixed with one pint olive oil. Buff with soft cloth.

Chapter 6

Rethink / Reuse / Recycle

In years gone by, all garbage generated was either buried or burned. Today, all Cape landfills are closed and trash is shipped off Cape, where it is incinerated to generate electricity.

Each year local residents produce tons of garbage.

As Cape residents, what can we do?

Let's start by reducing our trash and disposing of it properly. Recycling is taking the first step.

GLASS PAPER METAL PLASTIC

Chatham operates our Transfer Station facilities where trash and recyclables are collected. These are then transported off-Cape. Chatham's drop-off facility is set up for efficient collection of your glass, paper, cans, and plastic!

Paper and Cardboard

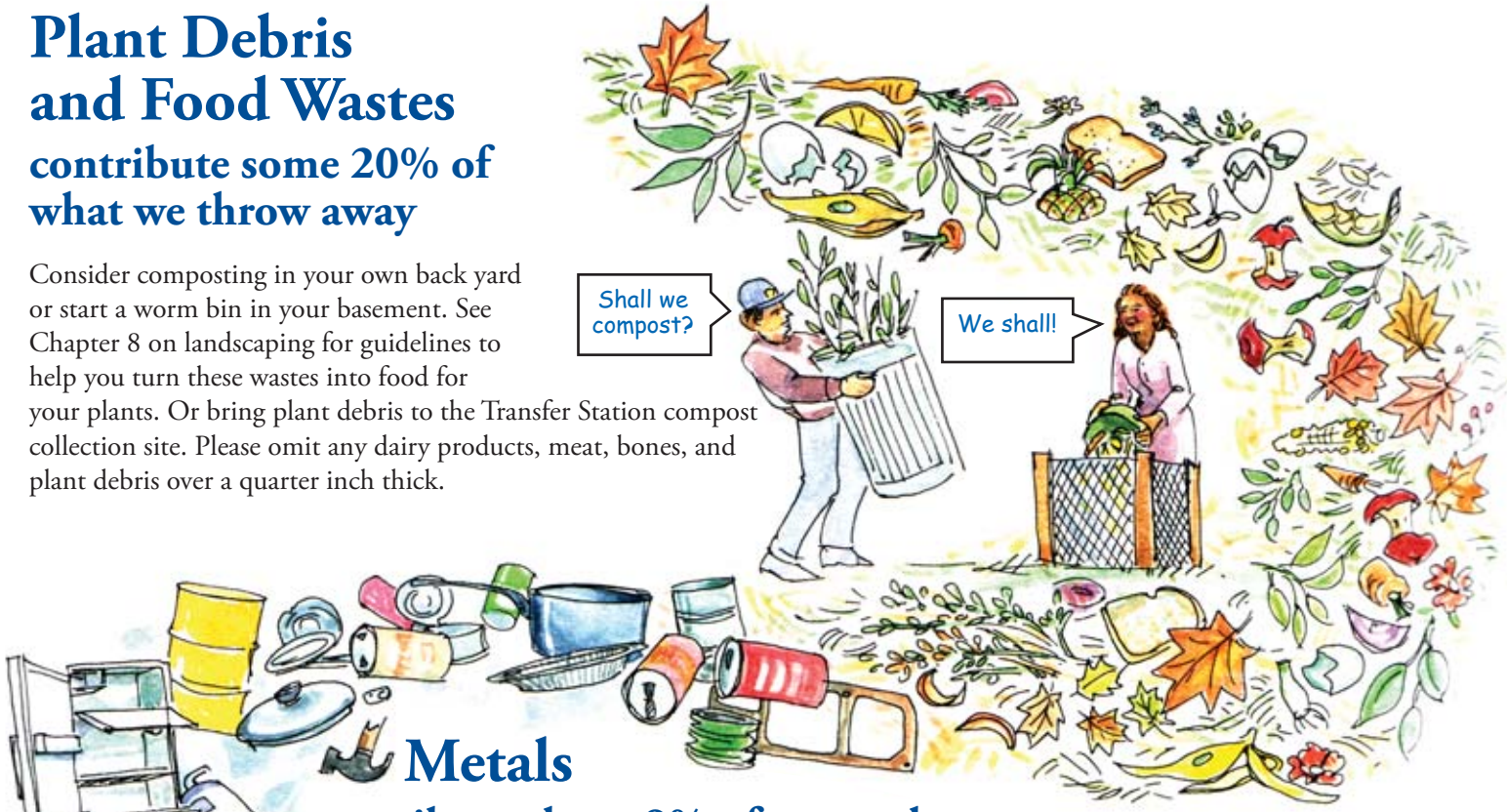
account for one-third of our trash

Here is where we can make a big difference! The production of paper using recycled fibers reduces water pollution by roughly a third and air pollution by over half. Fortunately, newspaper, magazines, corrugated cardboard, junk mail/mixed paper and telephone books are now recyclable. Reduce the flow of paper coming into your household. Get on the "DO NOT MAIL" list, contact catalogue sources, and "opt out" of credit card offers, and you will see a dramatic drop in your direct mailings. For more information, see our Resources Chapter.

Plant Debris and Food Wastes

contribute some 20% of what we throw away

Consider composting in your own back yard or start a worm bin in your basement. See Chapter 8 on landscaping for guidelines to help you turn these wastes into food for your plants. Or bring plant debris to the Transfer Station compost collection site. Please omit any dairy products, meat, bones, and plant debris over a quarter inch thick.



Metals

contribute about 9% of our garbage

Making products from recycled metals uses far less water and energy, causing far less water and air pollution than the mining and processing of the raw materials. Ferrous metals (those containing iron) and nonferrous metals (like aluminum cans) are easily recycled at the Chatham Transfer Station. Clean "deposit"cans may be left at the Scouts' drop-off shed also at the Transfer Station or redeemed at local stores. Other metals, like aluminum, copper and lead, are also recyclable.

Glass

contributes about 9% of our garbage

Glass food and beverage containers can be recycled; deposit bottles may be returned to stores or the Transfer Station. Glass should be rinsed and sorted by color. Ceramics, incandescent light bulbs, and mirror and window glass are not accepted but fluorescent bulbs that contain mercury are accepted.

Plastics

contribute about 10% of our total garbage

Balloons on local beaches are a particular hazard to wildlife.

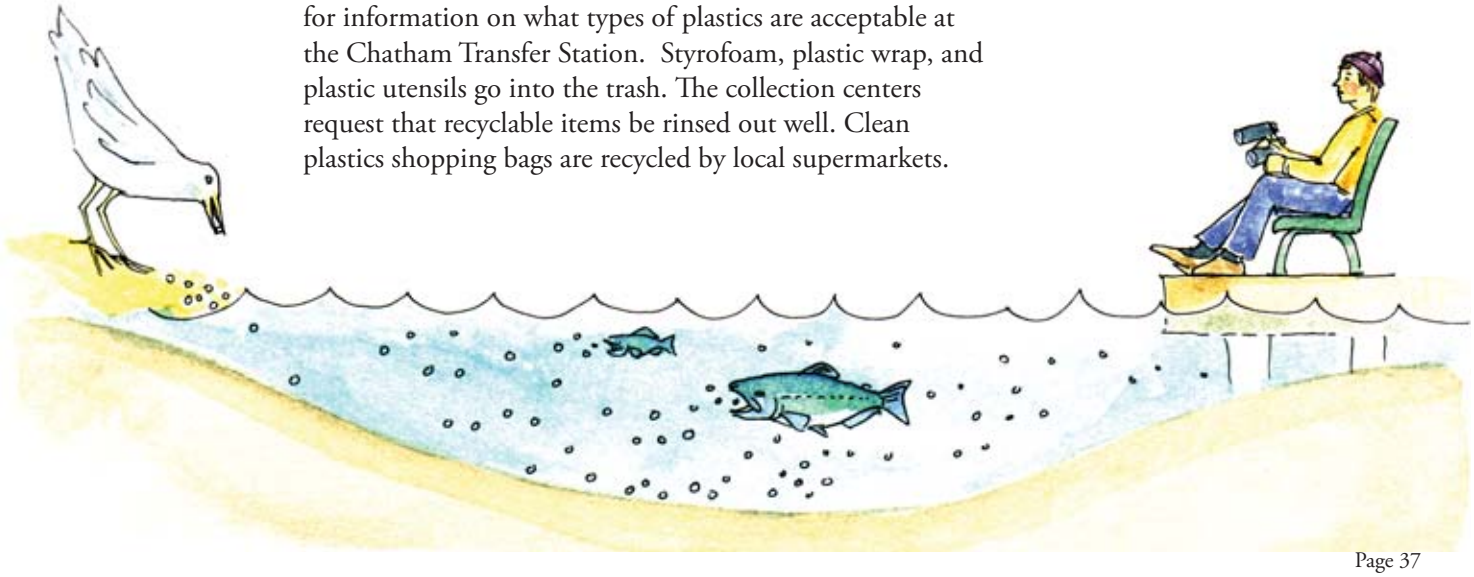
Plastics present some of the biggest challenges for householders. They take 300 years or longer to decompose and are made from non-renewable petroleum. The decomposition of some plastic foams is believed to play a role in the destruction of the Earth's ozone layer.

It's hard to find a Cape beach or pond shoreline that is free of plastic debris. Numerous water birds, marine mammals, and fish die each year from ingesting or becoming entangled in plastic. Even "degradable"plastics that are made to break into small particles in sunlight or in the soil raise concerns. While these products may lessen the danger of animal entanglement, many environmental scientists fear that the small particles pose a greater hazard than the larger, more unsightly plastic discards.

The good news:

Clean plastic bags are recycled at stores and supermarkets.

Many plastics are now recyclable, notably those marked # 1 PETE and #2 HDPE. See: www.chathamrecycles.org for information on what types of plastics are acceptable at the Chatham Transfer Station. Styrofoam, plastic wrap, and plastic utensils go into the trash. The collection centers request that recyclable items be rinsed out well. Clean plastics shopping bags are recycled by local supermarkets.



...and last:

Reusable Goods

Find a home for your intact or repairable home appliances, household goods, clothing, building materials, or any other items that can be repaired or used again. Have a yard sale, advertise items for sale in your local papers, donate them to local church thrift shops, the American Red Cross, Salvation Army or local thrift stores such as the Lower Cape Outreach Council or bring to the Gift Shop at the Transfer Station.

Six Simple Actions

to help improve water quality by recycling and reusing...

1. Precycle

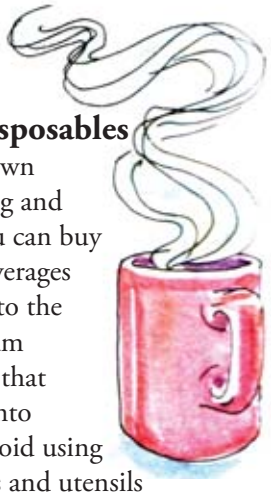
When you shop, look for products with limited or reusable packaging. Buy foods in recyclable containers or buy in bulk. Buy concentrates and items in refillable containers.

2. Use Cloth Diapers

The average baby uses nearly 4,500 diapers before being toilet trained. Unrinsed and improperly disposed of plastic diapers can contaminate our surface and ground waters. A week's worth of cloth diapers adds one or two extra loads of laundry a week.

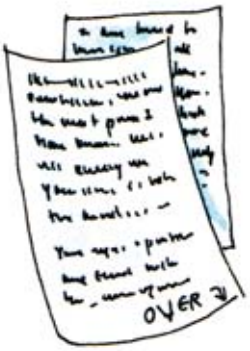
3. Avoid Disposables

By toting your own lidded travel mug and water bottle, you can buy hot and cold beverages without adding to the thousands of foam and plastic cups that find their way onto our beaches. Avoid using disposable plates and utensils



4. Reuse Writing Paper

Use both sides of paper sheets, make two-sided copies, and use blank sides for scratch paper and rough drafts. Buy and use paper products made from recycled paper.



5. Tote Bags

Telling the clerk "I don't need a bag" is a better solution than "paper or plastic." Choose a size you can easily carry when full.

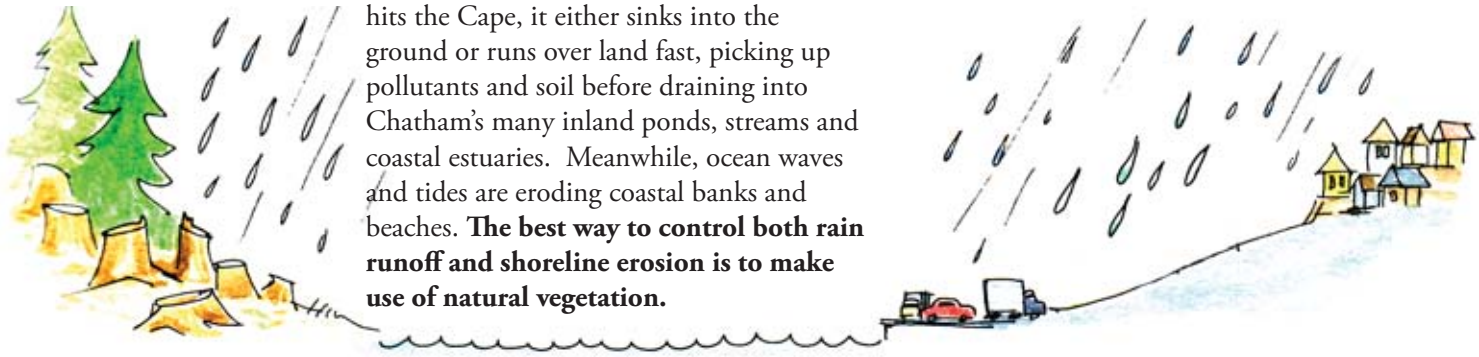
6. Buy Smart

Choose quality products that last a long time and don't have to be thrown out and replaced frequently.

Chapter 7

Spare that Shrub!

Do Your Part to Control Runoff and Erosion



Wind, waves, and rain are as much a fact of Cape life as summer sunshine. When rain hits the Cape, it either sinks into the ground or runs over land fast, picking up pollutants and soil before draining into Chatham's many inland ponds, streams and coastal estuaries. Meanwhile, ocean waves and tides are eroding coastal banks and beaches. **The best way to control both rain runoff and shoreline erosion is to make use of natural vegetation.**

Stormwater runoff damages the Cape's freshwater ponds and coastal estuaries by negatively impacting water quality. As runoff is swept toward wetlands and waterways, it carries a wide variety of pollutants such as heavy metals, paints, oils, grease, nutrients from lawn fertilizers, detergents, animal waste, and litter. Unchecked stormwater can also erode the land and carry soil sediments that can smother natural vegetation.

On natural landscapes, most rain infiltrates, soaks slowly into the ground and gradually drains through groundwater to nearby surface waters. During this gradual journey, there is time for uptake of many pollutants. But as more land is cleared for development, and more solid surfaces are built, such as roofs, roads, parking areas, and driveways, more of the water is collected by stormwater systems which often drain directly into ponds and the estuaries of coastal waters, with no chance for pollutant removal.

Dealing with Surface Runoff

The Power of Plants and Shrubs

We can't control the wind and rain but we can minimize the damage caused by runoff and erosion by taking advantage of the land's natural vegetation. Native species of shrubs, trees, and some grasses slow down runoff, hold soil particles in place, help maintain the soil's capacity to absorb water, and, along the shoreline, absorb wave energy. The roots of plants also help filter pollutants from the water before it enters freshwater or marine ecosystems.

Natural wetlands such as salt marshes, swamps, and bogs are especially good at slowing down the flow of runoff and filtering pollutants from the water passing through them, thereby protecting groundwater which we depend upon for drinking water on the Cape.

Our coastal wetlands also defend against flooding and storm damage. The marshes surrounding the ponds and bays act as sponges to absorb and contain floodwaters and buffer upland areas from waves. This is why it is essential to preserve the region's wetlands.

At home, you can help runoff absorption by decreasing the size of your lawn and paved surfaces, and adding more native plants and shrubs. Seek out professional advice on what you can do to contain runoff on your own property or properly treat stormwater on your private roadway. Support town efforts to control road runoff by installing catch basins or other stormwater structures that detain and filter the water before it enters the ponds or groundwater.

Tips for decreasing household surface runoff problems:

Where impermeable surfaces are already in place, divert rain from the paved surfaces onto grass or into vegetation to allow gradual absorption.

Preserve established trees and shrubs and plant new ones to encourage excess rainwater to filter slowly into the soil. Plant and maintain a vegetated buffer strip at the top of steep slopes and along water bodies in consultation with the Conservation Commission

Install gravel trenches along driveways to collect water and allow it to filter into the soil.

When removing unhealthy trees, leave the stump and roots in place to hold the soil.

Pick up litter and animal waste, and keep your car in good shape to avoid leaks.

Use grass-lined swales, berms and basins to control runoff on your property, reduce its speed, and increase the time over which the runoff is released.

Be sure downspouts from gutters direct rainwater in such a manner that it does not directly discharge over a bank to a wetland.

Minimize the creation of new impervious surfaces. Use special paving stones instead of concrete, groundcover instead of grass, gravel and pervious pavement instead of standard asphalt. The classic Cape Cod driveway features crushed quahog shells.

Avoid using chemical fertilizers, but if you feel you must, use slow-release fertilizers with low nitrogen, low phosphate content and follow directions as stated on the package for proper application rate.

Minimize lawn areas and plant more native plants. Native species require less maintenance because they are adapted to Cape soils and conditions and are pest resistant and drought tolerant, thereby reducing the need for fertilizer and pesticide use.

Don't throw yard debris, grass clippings or Christmas trees over banks or onto dunes or beaches; they smother the natural vegetation that holds the soil in place, can introduce invasive species into natural areas, and contribute to excess nutrients or yard chemicals. Chatham has a composting program at the Transfer Station where you can dump yard debris where it will be recycled into mulch which in turn is made available free to residents.

If you build a new home, ask your builder to leave as much of the original vegetation as possible on site. Before the start of construction make sure that strawbales and silt fences are installed around the work site to contain sediment and control erosion.

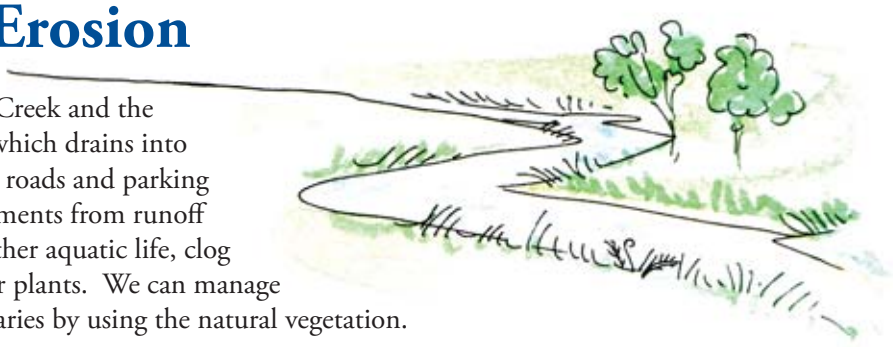
Alternatives to Asphalt and Concrete

Around properties, many hard surfaces, or impervious surfaces are used such as asphalt, cement, etc. when softer surfaces are preferable to protect our water quality. There are many paving surfaces that provide the durability of concrete while allowing rainwater to soak into the ground. Bricks and flat stones, for instance, make an attractive, durable driveway and, if placed on well-drained soil or on a sand or gravel bed, allow rainwater to filter into the ground.

Wood decks, usually installed for their functional good looks, can also serve as a form of porous pavement. Redwood and cedar, for example, are as durable as most other paving surfaces. The space between the deck boards allows rainwater to drain directly onto the soil surface and soak into the ground. Maintaining a distance between the soil surface and the decking will minimize the risk of wood rot.

Other new porous materials are also becoming available.

Pond and Streamside Erosion

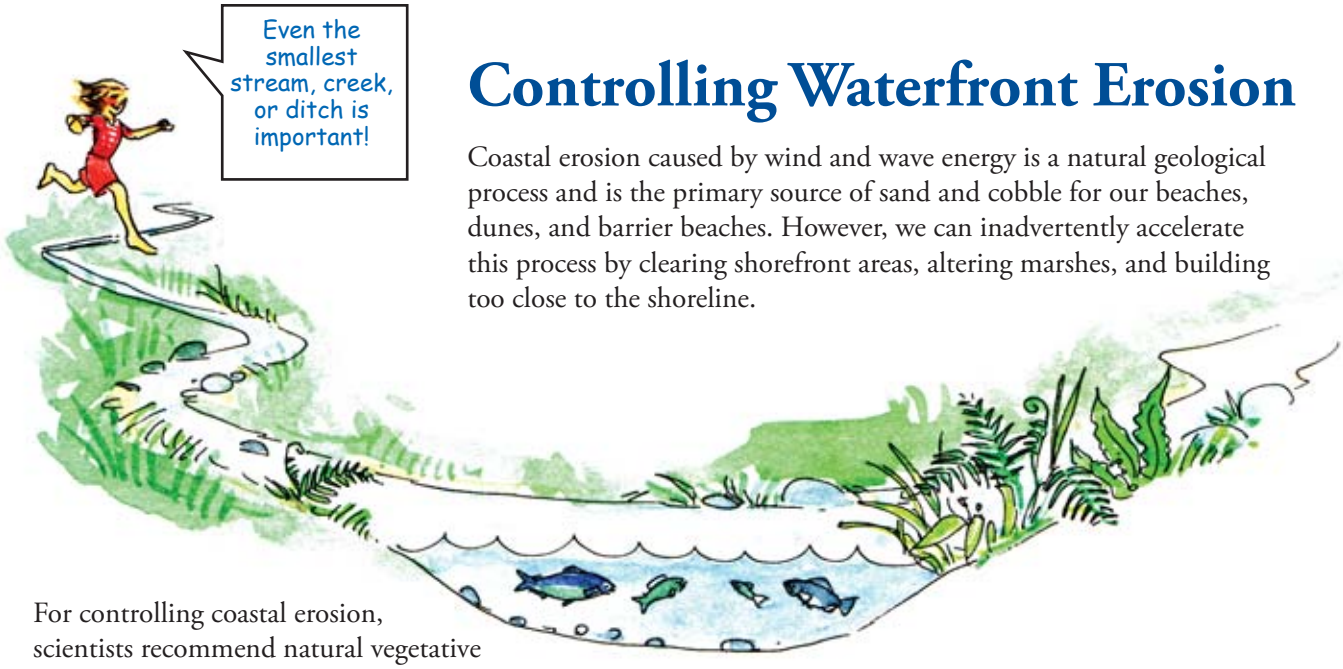


Creeks and streams, like Muddy Creek, Frost Fish Creek and the stream leading to Taylor's Pond form the network which drains into our estuaries. They carry runoff from lawns, fields, roads and parking lots that contain pollutants and soil particles. Sediments from runoff and from eroding stream and pond banks can smother aquatic life, clog fish gills and cut off the light needed by underwater plants. We can manage the quantity and quality of water entering our estuaries by using the natural vegetation.

Vegetation is vital to both the stability of the shoreline and the health of the water body. Trees and low bushes, as well as large snags and other natural structures, protect the banks from severe erosion. They also make great habitats for many fish species and help regulate water temperatures by providing shade.

If you live on a pond or stream, always avoid large-scale removal of natural ground covers. As much as possible, leave the banks and channels in their natural unaltered condition. Besides, it's illegal to do so under both state and local wetlands protection regulations without prior review and approval by the Chatham Conservation Commission. It's better to maintain a buffer of natural vegetation, as wide as possible along the top of the bank or pond shores.

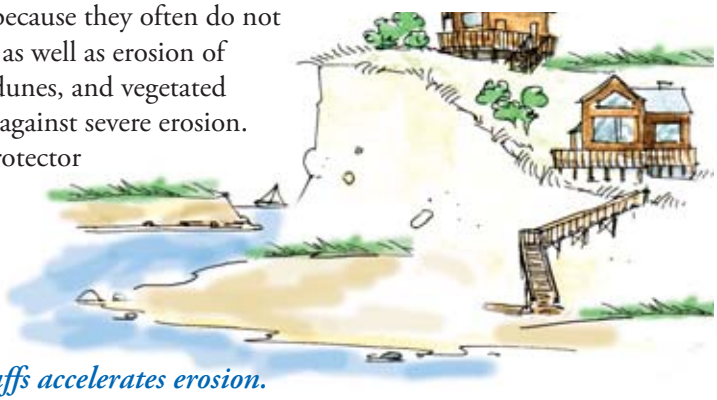
Before you start any work near a wetland or water body, you must call the Conservation Commission for a determination of whether the property is subject to wetland regulations. You will also be able to obtain information about how to best protect water quality.



Controlling Waterfront Erosion

Coastal erosion caused by wind and wave energy is a natural geological process and is the primary source of sand and cobble for our beaches, dunes, and barrier beaches. However, we can inadvertently accelerate this process by clearing shorefront areas, altering marshes, and building too close to the shoreline.

For controlling coastal erosion, scientists recommend natural vegetative solutions over hard structures like sea walls, jetties, and rock bulkheads. The latter were built to protect against erosion but often have the opposite effect because they often do not reduce wave energy and can result in erosion of the beach in front as well as erosion of adjacent properties. Natural structures like salt marshes, beaches, dunes, and vegetated banks are more efficient in dissipating wave action and protecting against severe erosion. When enjoying the beach, look for dune grass. It is the primary protector of our beaches.



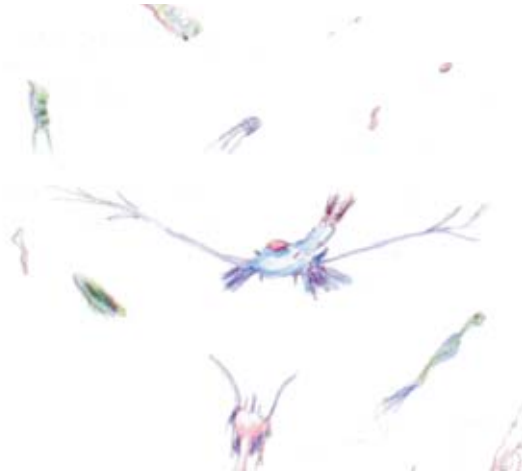
When water and land wrestle, the water always wins.

Walking over coastal dunes or sliding down coastal bluffs accelerates erosion.

The key to limiting runoff and erosion is using the right types of plants. Plants with strong root systems help stabilize banks while salt-tolerant plants work best on dunes. Only a few plants can thrive on the coast and each one has its place in the shoreline environment. These are some plants that help both absorb surface runoff and stabilize coastal banks: ***Beach Plum, Bayberry, Highbush/Lowbush Blueberry, Seaside Goldenrod, Winterberry, Bearberry, etc.***

- Contact the Chatham Conservation Commission for help in permitting and designing a shoreline vegetation plan.
- Join your neighborhood pond association.
- Ask Chatham Town Selectmen and Highway Superintendent these questions: "Is it possible to use less asphalt, more pervious surfaces?" "Why not let that roadside vegetation grow to reduce runoff rate and filter pollutants rather than cut it down?"

Cape Cod Neighbor



Plankton: The Ocean's Pasturage

Plankton may be small, but they are mighty. Little known and nearly invisible, these exquisite organisms exist in astounding numbers and are the foundation of life in our waters. Plant plankton (phytoplankton) produce the lion's share of the Earth's oxygen. Phytoplankton is eaten by animal plankton (zooplankton), which in turn is eaten by many other animals in the food web. Finfish, shellfish, and crustaceans begin their lives as plankton. Without plankton, our water ecosystems would collapse. Viva plankton!

Cape Cod Neighbor

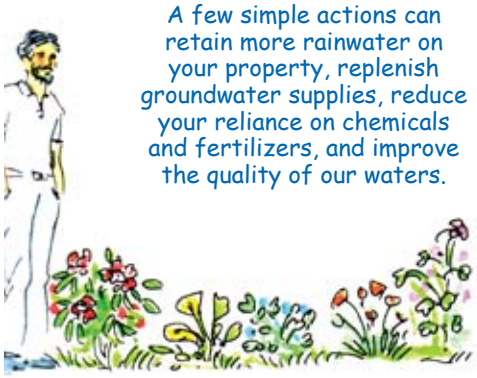
Blue Crab: Beautiful Swimmers

The scientific name of the blue crab, *Callinectes sapidus*, means beautiful swimmer. This name comes from its two paddlelike back appendages that help the blue crab glide gracefully through the water. A common denizen of our shallow estuaries, it prefers brackish waters to open bays. Cape Cod is at the northernmost edge of the blue crab's East Coast habitat.

Chapter 8

Landscaping for Healthy Watersheds

From Great Hill through Lovers Lake and Stillwater Pond to Ryders Cove; from downtown Chatham and West Chatham to Oyster Pond, the Mill Ponds and Stage Harbor; from North Chatham to Pleasant Bay and Chatham Harbor; from Chathamport to Jackknife Cove, Bassing Harbor and Crows Pond; from Riverbay to Muddy Creek; from West Chatham to Taylor's Pond; and from South Chatham to Red River and Cockle Cove most of the rainfall that reaches this area eventually finds it way into our ponds, lakes, and bays. We can help manage this flow and help keep our waters clean by landscaping wisely.



A few simple actions can retain more rainwater on your property, replenish groundwater supplies, reduce your reliance on chemicals and fertilizers, and improve the quality of our waters.

Thoughtful landscaping can change the volume, velocity and quality of the water that flows from our properties. Native trees, shrubs, and groundcover can enhance the appearance and value of your property while protecting biodiversity, providing food and shelter for wildlife as well as aiding in reducing stormwater runoff, which transports excessive nutrients, pollutants and sediment to local waters.

Getting Started...

If you are building a new home, retain as much of the native vegetation as possible. This will not only reduce runoff and pollution, it will give you a head start on your final landscaping and may save you money. Before you start a project, consult the Chatham Conservation Commission to learn if there are guidelines governing landscaping in your location or if a formal review by the conservation commission is required. The property owner is responsible for obtaining any necessary permits. The Conservation office can provide you with lists of native plants for your planting conditions.

Conservation Commission wetlands regulations control the cutting of vegetation adjacent to wetland resource areas – any unauthorized cutting may result in local/state fines. If you abut a pond, stream, or estuary, it is particularly important to leave a vegetation buffer to absorb excessive runoff and prevent erosion. Without a buffer, nutrients transported from the land flow directly into the waterways, stimulating excessive proliferation of algae and seaweeds. These plants can dramatically reduce oxygen levels in the water, making it impossible for the local fish and shellfish to survive. Vegetative buffers of native plants also provide natural habitat for native insects and animals. A vegetated buffer strip of as little as 10' – 20' wide along a wetland or waterbody can help mitigate the effects of a fertilized lawn and managed landscape, trapping potential pollutants and nutrients. The wider the vegetated buffer, the more effective it is in protecting water quality and wildlife habitat.

Well-planned landscaping offers other benefits. You can reduce your heating and cooling costs by as much as 30% just by planting and clearing wisely. Trees, shrubs, and groundcover also attract wildlife and require much less maintenance, fertilizers, and pesticides than grass.

Appropriate Plants for Lower Cape Landscapes

Before you head to the nursery, consider the growing conditions that define your land. Different plants require different kinds of soil, nutrients, and exposure to the sun. Parts of your property may also be subject to wind, foot traffic, or salt spray.

Check the soil. Plants that require good drainage grow well in sandy loam. Clay holds water so plants that like constant moisture thrive in it. You can guess your soil type by taking a handful of moist soil and squeezing it into a ball. If it holds

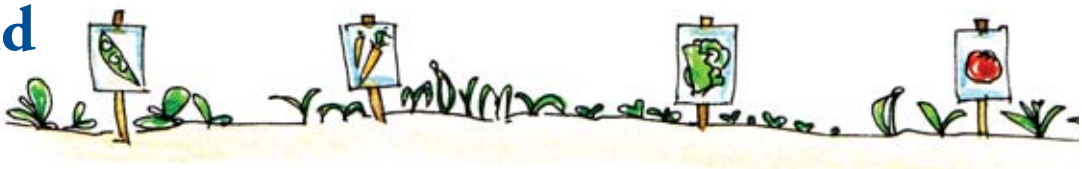
together slightly before breaking up, you have sandy loam. If it stays together, you have clay or a clay blend. Better yet, have soil samples tested for type, pH (acidity), nutrient availability and mineral content. Check the Resources Chapter for information and kits for soil testing.

Choosing the "right plant for the right place" is an important consideration for all landscaping. Careful planning and site evaluation are the first steps in applying this concept. The Cape Cod Cooperative Extension has a pamphlet addressing this important principle entitled "Right Plant, Right Place" – a Plant Selection Guide for Managed Landscapes which provides lists of different types of trees and shrubs suitable for the varied conditions found on Cape Cod (capecodextension.org/home).

How to Choose?... Go Native!

Matching the need of your plants to the conditions of your landscape decreases the need for extra water and fertilizer and increases your plant's resistance to disease and pests. Plants native to the Cape are well adapted to our climate, soil, and water supply; they are less bothered by salt, disease, and pests than plants introduced from other areas. Native trees, shrubs, groundcovers, and grasses provide shelter, nesting areas and food for a variety of wild critters, including hummingbirds and butterflies. Visit Chatham Conservation Commission or Chatham Garden Club to obtain lists of native plants suitable for planting in our area. Other sources of information include the Heritage Plantation Museum and Gardens in Sandwich, Cape Cod Museum of Natural History, National Seashore Visitor Center, Mass. Audubon's Wellfleet Bay Wildlife Sanctuary, and the Barnstable County Cape Cod Cooperative Extension office; all these locations provide excellent publications. Local nurseries will help you select plants appropriate to your yard and soil type.

Plants to Avoid



Certain plants are considered harmful exotic invasives because they are aggressive competitors with a speedy growth habit, spread quickly either by seed or root, and have the ability to naturalize in wild areas and choke out indigenous plants. Commonly seen in Chatham are Autumn Olive, Purple Loosestrife, Porcelain Berry, Phragmites, Asiatic Bittersweet, Japanese Knotweed, Privet, Japanese Honeysuckle, English Ivy, Tree of Heaven, Multiflora Rose, Bamboo, Burning Bush, Scotch Broom, and Japanese Barberry. Foreign invasive species reduce the number of native species, change the physical structure of a habitat, disrupt the food web, and delay the long-term process of succession.

An example commonly seen at the edge of marshes is Phragmites or Common Reed. It is a particular enemy of salt marshes – because it spreads aggressively by above ground runners, its root system, as well as by seed, it chokes out diversity and causes the decline of many salt marsh species, habitat for many shellfish and finfish.

For a more complete list of invasive species, contact the conservation office or see www.ipane.org. Do not use these plants in your landscaping and before removing any vegetation within 100 feet of wetland resources, be sure to contact the Conservation Commission first.

There are aquatic invasive plant species that can impact waterways. These species include Eurasian Water Milfoil, Hydrilla and Yellow Water Iris. Eurasian Milfoil clogs waterways and is found in freshwater bodies. It can reduce oxygen and cause fish kills. Hydrilla is considered one of the top problem water weeds because it degrades the water quality, reduces oxygen and fouls waterways. To avoid spreading these invasives into waterways boaters should check to be sure that boating gear is free of plant debris. Never empty aquariums into waterways and use native aquatic plants in your watergarden. For more information: www.mass.gov/czm/invasives/index.htm

Gardening

Whether our garden is in a window box or on a large farm, many of us enjoy growing our own vegetables, fruits, flowers and herbs. By using effective gardening techniques, we can produce plants to be proud of while preserving the soil, enhancing the absorption of rainfall, and protecting local streams and ponds from sediments and chemicals.

Start by picking the right spot for planting. Choose a sunny location with good natural drainage. Whenever possible, avoid sloping areas and drainage channels that let topsoil wash away during heavy rains.

If you live close to a dune or a coastal bank, it is important to protect these areas as they provide a buffer to waves-induced erosion and flooding. American beach grass works best within sandy dunes because it is tolerant of salt spray, exposure to wind and waves, and accumulations of sand, and it has a thick root system that help build up and stabilize windblown sediment. The roots of plants such as dusty miller, beach pea and seaside goldenrod also stabilize and build up sand dunes. Bayberry, Virginia rose and beachplum are good on back dunes and on the top of coastal banks as they are adapted to coastal environments and can tolerant to salt spray. As always, check with the Chatham Conservation Commission prior to undertaking new projects near the coastline to be sure you have the proper authorization.

If you are landscaping the area of your septic system it is important to know the exact locations of all the septic system components and to landscape it is such a ways that you don't need to dig up your entire garden if repairs are necessary. It is particularly important to use native plants to eliminate the need for watering which can interfere with the effective functioning of your leachfield. It is important to choose plants that have non-invasive roots and that provide coverage over your septic system throughout the entire year. Low maintenance ground covers or wildflowers or shallow rooted perennials are good choices. Check with the Health Department for a list of appropriate plants that can be used over leaching fields.

Watering

Water is crucial for good plant establishment. All newly planted areas need to receive approximately 1" of water per week during the growing season from April through October. By using native plants that are adapted to the sandy soils found on Cape Cod the need for watering can be largely reduced once the plant is established. Because the soils are so permeable and do not hold water well, plants that are not drought tolerant will require large amounts of water and will be more susceptible to insect and disease problems. A good two inches of mulch will help reduce the loss of soil moisture.

Irrigation systems require a permit from the Chatham Water Department and if the system is to be installed in an area under the Conservation Commission's jurisdiction, a wetlands permit will be needed as well. Irrigation should be planned at least 10 feet away from the edge of the leaching field of your septic system. If you already have an irrigation system, be sure it has a rain sensor to avoid unnecessary watering.

Using a water collection system, such as a rainbarrel, is a good way to obtain water while reducing your water bill. With an average of 28 inches of rain falling on a 1000 square foot roof, over 15 thousand gallons of rainwater can be generated during the growing season. If not collected this rainwater can runoff as stormwater possibly causing erosion and pollution and is not available to replenish the aquifer. Look for local or county programs where rainbarrels are offered at reduced price.

Mulching

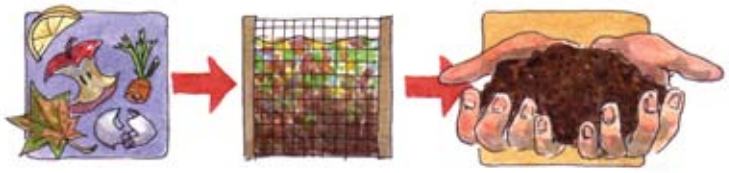
Mulch is a protective covering of compost, straw, grass clippings, or leaves placed around plants. Many homeowners also like to use seaweed. Mulch can add nutrients, make the soil more workable, aid rainwater penetration, help control weeds, and improve the moisture-retaining capacity of the soil near roots. Mulch also minimizes losses of nutrients and topsoil. Root zones of newly planted trees and shrubs should be mulched to a depth of about 2" to the drip-line, except for the area directly adjacent to the trunk.

Avoid using landscaping plastic beneath decorative rock or bark as it impedes the infiltration of rainwater into the soil.

Fertilizing

The watchword here is to use as little as possible, if any. Excess nutrients from fertilizer can leach through the soil into the groundwater, or may be washed by rain into storm drains. These nutrients can contaminate our drinking water and cause algal blooms in ponds and estuaries. By using good gardening principles, you can limit the amount of fertilizer. If you do find that additional nutrients are necessary to supplement the soil, chose an organic, slow-release, water-insoluble fertilizer and use sparingly or use compost from your compost pile or obtain free from the Chatham Transfer Station at 97 Sam Ryder Road.

Composting

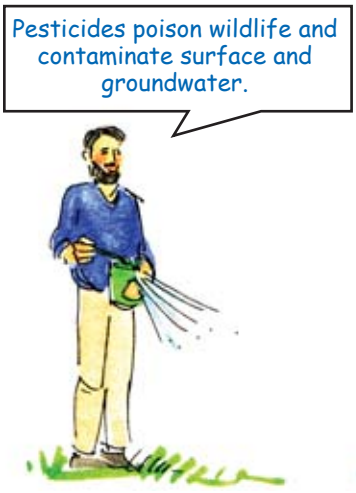


Compost is a dark, crumbly, and earth-smelling form of decomposing organic matter. Perfect for mulch, compost enriches soil and improves plant growth. Composting is a practical way to transform yard, kitchen, and garden wastes into a valuable resource.

In Chatham, you can choose to compost these wastes yourself, or you can take grass clippings, leaves and pine needles to the Chatham Transfer Station for free with a Transfer Station permit; brush can be brought there for a fee. The town turns your yard waste into compost and mulch, which is available free to anyone with a permit. Homeowners should consider the option of creating their own compost system since composting is also the answer for up to 10% of your garbage created by food wastes other than meat, bones and fatty foods. Composting bins and kitchen scrap buckets are available to the public from the Town of Chatham at a bargain price through a grant from the MA Department of Environmental Protection; contact the Department of Health & Environment at (508) 945-5164 or the Transfer Station (508) 945-5156.

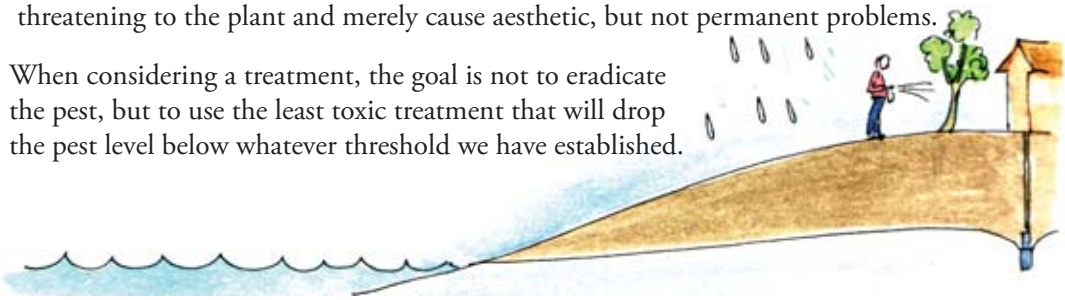
Pest Management

For years, pest control has meant chemicals. Once viewed as safe and effective for insect control, chemical pesticides are now considered ecologically harmful. They poison wildlife, contaminate water and soil, and harm humans, especially children, and pets. Many pesticides last a long time. When they enter the aquatic system, they can move from place to place, causing problems all along the way.



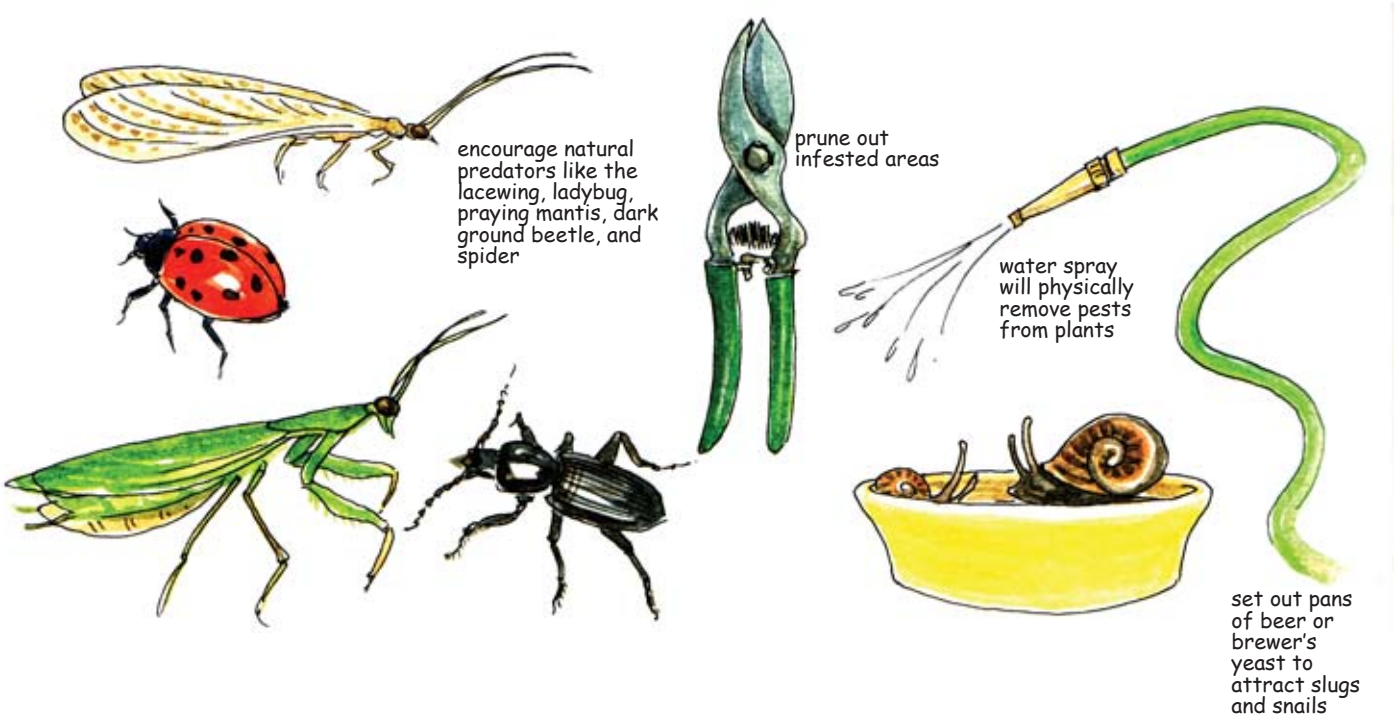
After planting adapted plant varieties, providing the necessary nutrients and moisture, and following through with good maintenance practices, gardeners should determine the threshold level of weeds or insect damage they are willing to accept. Setting our pest tolerance too low results in unnecessary treatments and possible environmental damage. Most pests are not life threatening to the plant and merely cause aesthetic, but not permanent problems.

When considering a treatment, the goal is not to eradicate the pest, but to use the least toxic treatment that will drop the pest level below whatever threshold we have established.



Here are some simple things we can do:

- Encourage natural predators like the lacewing, ladybug, praying mantis, dark ground beetle, and spider.
- Prune out infested areas.
- Use water spray to physically remove some pests from plants.
- Set out pans of beer or brewer's yeast to attract slugs and snails.
- Cut down on the number of mosquitoes breeding in your area by removing old tires, changing birdbath water regularly, and eliminating items around the yard that may collect standing water.
- Avoid planting and harvesting when insects are most abundant and damaging.
- Buy plants that are resistant and free of pests and diseases.
- Provide plants with the growing conditions that they like best. This helps them resist pests and diseases.
- Remember that gardens with a variety of plant types are less susceptible to insect damage.
- Use organic products if possible. Your local garden center can suggest useful products.
- Encourage insect-eating birds by providing bird houses and baths. For more information on nontoxic alternatives to pest control, see Chapter 13.



What Else Can I Do?

- Support municipal composting.
- Request and buy organically grown food. This will help encourage the many farmers who want to use non-toxic pest control techniques.
- Find out how public areas are treated, for example, roadsides, municipal parks or golf courses. Urge the town to minimize or eliminate the use of herbicides and pesticides, particularly near waterbodies and children's playgrounds.
- Support Chatham's efforts to eliminate and control invasive plants.
- Take advantage of informational resources such as the Cape Cod Cooperative Extension.

Cape Cod Neighbor

Great Blue Heron: Walking in the Wetlands

That large graceful bird that you see wading among the marsh grass is undoubtedly a Great Blue Heron. Note its long legs, yellowish beak, and grayish blue color. In flight the bird's neck is held in an S-shaped configuration and its wingspan can exceed six feet. The Great Blue catches fish by standing quietly and then spearing them with its sharp beak. The survival of this magnificent bird depends on healthy wetlands.

Drawing by Barbara Holden

Cape Cod Neighbor

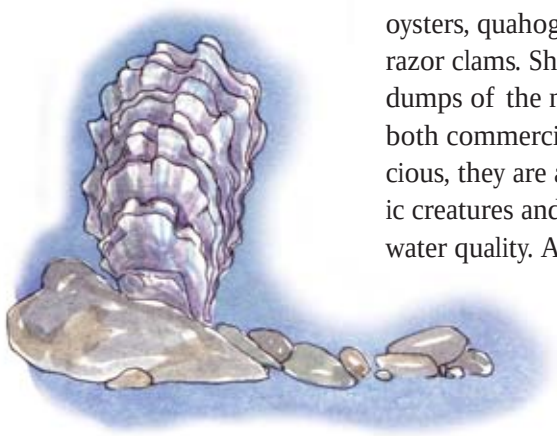
Osprey: Famous Fish Hawk

A coastal superstar, the Osprey's resurgence on the Cape is a success story. Their decline resulted from the disruption of nesting sites and the use of DDT, which thinned their eggshells. With the banning of DDT and the construction of nesting platforms, there are now 6 or more coastal nesting pairs of Osprey that fledge offspring in Chatham that rely on our fresh and marine waters for food and habitat; a family of four requires more than six pounds of fish a day.

Drawing by Barbara Holden

Cape Cod Neighbor

Bivalves: Nature's Water Filters

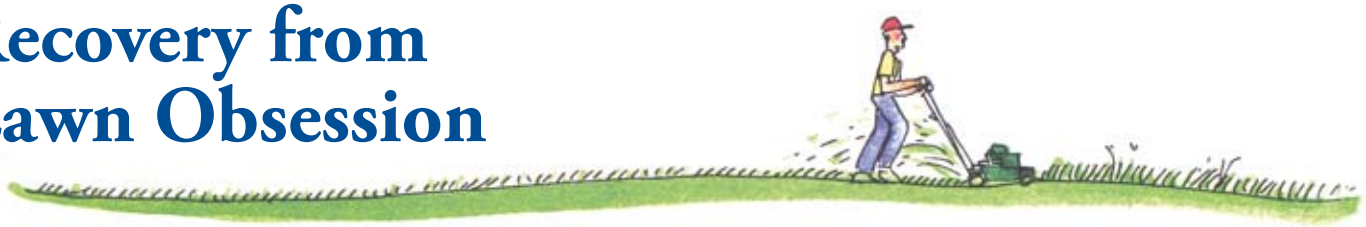


If you have taken a walk on the beach, you've noticed the incredible diversity of shells that wash up on the shore. These are the remains of the many species of mollusks that live in our salt ponds, harbors and bays. These species include oysters, quahogs, soft shell clams or steamers, bay scallops, mussels, and surf and razor clams. Shellfish harvesting can be traced back to 'shell middens', the garbage dumps of the native Americans. Today, shellfish beds continue to be harvested both commercially and recreationally. These amazing creatures are not only delicious, they are also great for the environment. As they feed by filtering microscopic creatures and organic debris from the water, they act as natural filters to improve water quality. A full-sized oyster can filter more than 25 gallons of water per day!

Because these animals are filter feeders, bivalves are also among the first creatures to suffer from pollution and poor water quality. They are the 'canaries in the coal mine' of the marine environment.

Chapter 9

Recovery from Lawn Obsession



Are you or someone you love addicted to a dream lawn? You are not alone...

The perfect suburban lawn has become an American obsession, turning us into lawn-chemical junkies who require increasing amounts of pesticides, herbicides, and fertilizers to satisfy our cravings for immaculate turf. Billions of dollars are spent on television advertising to convince us to buy the latest lawn care products and to look with alarm at stray dandelions or clover.

But there's a catch. **Dream lawns are not safe for people, pets, or the countless wild things that normally inhabit our yards.** Lawn chemicals poison our drinking water and contribute to the deteriorating health of our ponds and bays - artificially green lawns produce green waterways.

Right here on the Cape, there is an easy and inexpensive remedy for the American lawn habit: the traditional Cape yard, a natural habitat that includes a variety of indigenous grasses, mosses, lichens, and wildflowers. These native ground covers survive summer heat and drought without pampering, poisoning, or polluting. They also feed birds, bees, butterflies, and are safe for children and pets.

Remember that lawns, particularly turf lawns, do not belong next to waterbodies. If you already have an established lawn that is adjacent to a waterbody, the Cape Cod Cooperative Extension has determined that by creating, at a minimum a 10- to 20-foot wide buffer of native vegetation between the lawn and the water's edge, the effects of a fertilized lawn and managed landscape can be mitigated. This assumes that any fertilizer is applied at the correct rate and with proper application methods.[1]

[1]Clark, Roberta A., *Selection and Maintenance of Plant Materials for Coastal Landscapes.*

12 Step Program for Dream Lawn Addicts

Step 1 - Just Say "NO" to Pesticides and Herbicides

Make a firm commitment to protect your family, your pets, and your neighbors from lawn chemicals. The first step is to dispose of all your old pesticides, herbicides, and fungicides at the next local hazardous waste collection day. If you plan to use a professional lawn care company, hire one of the region's organic landscapers. If you decide to go cold turkey, get support for kicking the lawn chemical habit. Research the dangers of these substances or consider the following:

- By State law, all schools in our region now restrict pesticide use to protect children. It's up to you to protect them at home.
- The risk of canine malignant lymphoma doubles with the use of herbicide 2,4-D on a dog owner's lawn.
- Many Canadian municipalities have banned or severely restricted the use of common lawn-care pesticides including the herbicides 2,4-D and MCPP.
- So called "inert" ingredients in lawn chemicals can amount to 95% of the product and may be more toxic than active ingredients.
- Golf course maintenance crews working with toxic lawn chemicals face elevated risks of dying from brain cancer, lymphoma, prostate cancer, and large-intestine cancer.

67 million pounds of pesticides are used on American lawns every year.

Lawn pesticides get carried indoors on shoes and paws and can persist for months in your home and the air or trapped in carpets, dust, toys, etc.

Step 2 - Be Patient, Poisoned Soils Need Time to Heal

The sooner you stop using toxic chemicals, the faster your soil will regain its natural health. Past use of lawn chemicals may have destroyed the microbiotic life that exists in healthy soil; it may take three years for your soil to recover its natural defenses. Meanwhile, there are nonpoisonous methods to treat for pests; consult the Resources listed in Chapter 13.

Step 3 - Reduce the Size of Your Lawn

Reduce your grass area enough to allow hand-powered reel mowing. It will provide you with a good cardiovascular workout without gym fees or air and noise pollution. In surrounding yard areas, create a Cape Cod meadow for native grasses and wildflowers that will sustain butterflies, bees, and lightening bugs. The Conservation Commission can provide you with suggestions for meadow plant mixtures for your planting conditions and tell you where you can buy the seed. Mow your meadow only once a year, in early May, to eliminate encroaching woody plants. Replace other lawn areas with native bushes and trees, a vegetable garden, and fern and moss beds for shady places. Plant groundcovers on steep slopes where mowing is dangerous.

If the above steps seem too extreme for you, reduce your lawn gradually; simply mow fewer rows each year. For those homeowners that live adjacent to waterbodies, it is important to eliminate mowing within up to 50ft or more from the waterbody and let native grasses and woody growth overtake the lawn.

Step 4 - Let the Clippings Fall Where They May

Keep mower blades sharp and mow to a height of 3 inches. Mow often enough so that no more than 1/3 of the grass height is removed with each cutting. Forget raking. If left on the ground, grass clippings provide more than a third of the nutrients your lawn needs. They decompose quickly thanks to earthworms and microorganisms. Clippings also conserve water by shading the soil from the sun and reducing moisture loss from evaporation. If you end up with extra grass clippings use them in the compost pile.

Step 5 - Fertilize with Compost Only

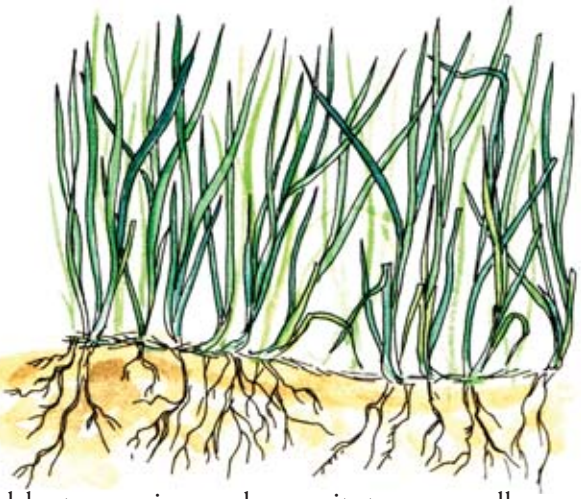
The best and safest alternative for the Cape Cod lawn is no fertilizer. Approximately 15% of the nitrogen that washes into our bays is from residential fertilizer use. Native grasses and wildflowers have always done well on their own. If you enjoy working on your patch of grass, feed it compost made from your own kitchen and yard wastes. If you're still hooked on fertilizer from a bottle or a bag, go organic or *insist that your lawn company does.* Measure and calculate your lawn's square footage. Apply slow release insoluble organic fertilizer in spring and fall, adding no more than 1 pound of actual nitrogen per thousand square feet of lawn. The more you fertilize the more you mow.

3 million tons of fertilizers are used annually on American lawns to keep them greener than normal or necessary.

Step 6 - Leave Watering to the Clouds

Summer dormancy is a natural rest period for your lawn. When hot dry weather turns your grass golden, don't fret; it will recover with autumn rains. Save summer watering for your favorite places in the yard and water early in the morning to cut down on evaporation.

30% of the water consumed on the East Coast goes to watering lawns.



Step 7 - Mix Those Seeds

If you must have an all grass patch of lawn, use fescue, rye, and clover. These are hardier and more drought resistant than bluegrasses. Clover contains nitrogen-fixing bacteria that will naturally fertilize your lawn. Look for seed containing fungi that are repellent to certain lawn pests. Seed in the fall when cooler and wetter days provide ideal conditions for germination and deeper root growth.

Step 8 - Forget the Lime

Cape soils are naturally acidic allowing a wide variety of mosses to thrive. Celebrate moss in your lawn as it stays green all summer and won't need mowing. For creative ways to landscape with moss see the Resources Chapter.

Step 9 - Leave Thatch and Aerating Woes to the Microbes

Organically managed lawns are alive with earthworms and beneficial microbes that naturally recycle thatch and aerate your lawn. If you must toil over your grass, get down on your knees, break up and aerate compacted areas by hand, and apply compost before reseeding.

Step 10 - Celebrate Diversity

Train your eye to appreciate variety in your lawn. As many as 50 species of plants may grow in a typical nonherbicided lawn. Daisies will naturally adjust to bloom below the height of a cutter bar; so will other wildflowers. Yellow wood sorrel adds texture and makes refreshing summer soups. You'll never have to mow patches of moss and lichens. As your dream-lawn addiction subsides, you will begin to appreciate additions of color and texture to your lawn. When weeding mania hits, do it by hand, or, if you must apply something, use "green"products for pre-emergent weed control.

Step 11 - Take a Walk on the Wild Side

Feeling seduced by the perfect turf on TV? Suffering from lawn envy? Take a walk in any of the Cape's nature preserves and appreciate the beauty of diverse grasses, wildflowers, lichens, and mosses that support bees, butterflies, and wildlife of all kinds. Find a field full of fireflies and you know you're in the right place. Try replicating that environment in your own yard.

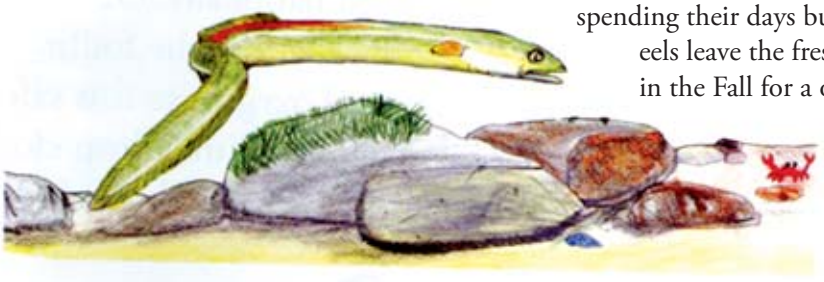
Step 12 - Become an Advocate for the Cape Cod Lawn

How will you know when you and your lawn have completely recovered? You will be spreading the word and not the poison. Share the good news with dream-lawn addicts, landscapers who use lawn chemicals, or the stores that sell them. If you play golf, find out what chemicals are being used on your greens; alert the groundskeepers to their increased risk of cancer. Help monitor what goes into the lawns of local parks, businesses, schools, and municipal greens. We can all help keep the Cape environment healthy and beautiful, our water drinkable, and our shellfish beds thriving.

Cape Cod Neighbor

American Eel: A Well-Traveled Fish

The long, slimy animal you might encounter in Cape waters is the American eel (*Anguilla rostata*) distributed from Greenland to Brazil. This fish has a narrow, streamlined body that helps it to swim rapidly. Eels are nocturnal, spending their days buried in mud. Part-time residents, adult eels leave the fresh and brackish waters of our waterways in the Fall for a one way voyage to the Sargasso Sea, off the Bahamas, where they gather in great numbers with eels from around the Atlantic basin to reproduce and then die.

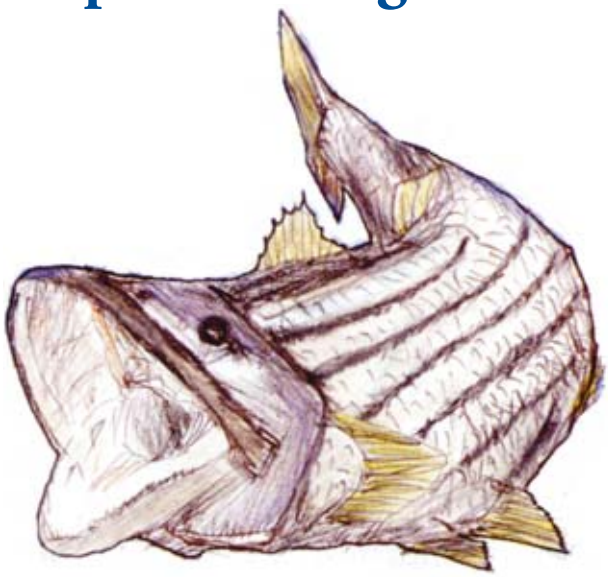


Cape Cod Neighbor

Lobsters: Life on the Ledge

Once known as poor man's food, lobster has made a comeback at dinner tables. Nearly 90% of legal-sized adult inshore lobsters are harvested every season. The heart of the local lobster fleet is based in Chatham Harbor and Stage Harbor. Nocturnal scavengers, lobsters eat almost anything they can find by crushing and ripping food with their large claws. Most lobstering in New England occurs during the spring, summer, and fall.

Cape Cod Neighbor



Bluefish and Striped Bass: The Angler's Favorite

Bluefish and Striped Bass are the most sought-after Cape fishes providing great sport through catch and release fishing, and great eating when you catch a "keeper." Striped Bass is the largest fish available to the nearshore angler ranging from one to over 60 pounds. Bluefish are usually ravenous and will strike at just about anything you give them. Watch out for those teeth! Whatever your favorite fishing spot, remember that only healthy waters provide the ideal habitat for your future dinner.

Chapter 10

Getting Out on the Water - Good Boating Practices

Recreational boating provides relaxation and enjoyment for thousands of residents and visitors. It contributes to the economy by providing jobs in boat manufacturing and service. Unfortunately, boating also contributes to the pollution of local waters. All of us - especially boaters - have a lot to lose if the quality of our waters deteriorates. As a boater, there is much you can do to help protect the waters that bring you so much pleasure.

Maintaining Your Boat

Many of the cleaning, dissolving, and painting agents used for boat maintenance are toxic to marine and aquatic life. A few simple precautions can prevent these chemicals from harming our coastal ponds, sounds, and harbors.

Bottom Paints

The more traditional copper and tributyltin (TBT) bottom paints that were used to prevent fouling cause environmental damage. "Fouling" refers to the whole host of organisms that can attach to and grow on the hulls of boats, affecting their performance. TBT has been shown to damage our shellfish populations and has been banned nationally. Other environmentally friendly alternatives are now available. These work by producing peroxides that kill the fouling organisms while they are still microscopic. The peroxide quickly breaks down into water and oxygen, so it is safe to use and does not hurt the environment. When scraping the boat bottom, catch the scrapings with a drop cloth. Use sanders with vacuum attachments and sweep up any scrapings or dust that may escape your drop cloth. Bring them to your next hazardous waste collection day.

Cleaning Your Boat

Rinse and scrub your boat with a brush or power washer after each use instead of using soap. If your boat is stained, use phosphate-free soap or laundry detergent, or any of the alternatives suggested in Chapter Five on hazardous waste. When possible, avoid products that remove stains and make your boat shine. They are extremely toxic. As a rule, avoid any products with a "Toxic" warning on the label; they can kill marine life if washed overboard or accidentally spilled into the water.

Bilge Wastes

Bilge water presents a major challenge for boaters. Since bilge water often contains oily wastes, boaters are often tempted to add detergent to it and pump it overboard. The detergent, already harmful on its own, breaks the oil into small floating droplets spreading the area of impact to the larval stages of the many marine creatures that inhabit the surface water. This practice is not only environmentally damaging, it is illegal and punishable with a State fine of up to $10,000 and local fines up to $200 per offense.

Is the best solution to take the oil/water mixture to the oil recycling container at the local marina? Unfortunately, no: the signs indicate "Oil only - no bilge wastes." What can a conscientious boater do? First, fix any leaks that might contribute oil to the bilges. Next, before pumping the bilgewater overboard, capture the floating surface oil with oil-absorbent pads, paper towels, or old nylon stockings. A product called a "bilge sock" can be used to sop up oily bilgewater. Bilge socks are available at local marinas.

Fuel

The traditional method for determining a full fuel tank is watching for fuel spilling from the tank over-flow vent. Fuel overflows are dangerous to people and toxic to fish and other aquatic life. Small fuel spills are subject to State fines up to $25,000, federal fines of up to $5,000, and local fines up to $200 per offense. Several commercial products are available from marine supply stores to help you prevent these overflows. The simplest is a container that attaches to the fuel vent to capture overflows. A more sophisticated tank vent surge protector works with automatic nozzles to shut off the fuel flow when your tank is full and with non-automatic nozzles that gurgle when it is time to stop pumping. Another similar product changes pitch when the tank is full. Even small spills need to be wiped up immediately to keep them from reaching the water.

Sewage

Human waste contains disease-causing bacteria and viruses that compromise safe public swimming and contaminate shellfish beds.
Sewage is a source of nutrient overload in coastal salt ponds, bays, and inlets. Nutrient enrichment "fertilizes" the waters and contributes to algae blooms and oxygen depletion, which kill marine life.

Be responsible with your waste. It is ***illegal*** to dump untreated sewage into the water, and violators are subject to a State fine of $2,000 and local fines up to $200 per offense. Even so called "treated sewage" from boats contains nutrients and bacteria. It is illegal to dump "treated or untreated" sewage in specified "No Discharge Areas," (NDA), for both recreational and commercial boats. Stage Harbor is currently designated as an NDA; an application for designation of Pleasant Bay waters is in process. Information is available from the Mass. Office of Coastal Zone Management (CZM), http://www.mas.gov/czm/nda/index.htm. If you have a toilet on your boat, it must be equipped with a Marine Sanitation Device (MSD). Acquaint yourself with the use and maintenance of the type of MSD on your boat. If your boat does not have an installed toilet, consider using a portable toilet. The Town of Chatham and most marinas have dump stations to empty portable toilets. Town dump stations are available at various Town landings, including the Fish Pier, Old Mill Boat Yard and Ryder's Cove.

Regardless of what type of MSD your boat has, sewage pump-out stations or portable pump-out units should be used to empty holding tanks when moored or docked in marinas and harbors. This service is FREE in many harbors. When cruising, check with the local Harbormaster to find the nearest pump-out facility. The Town of Chatham maintains a pump-out station at the Harbormaster's office in Stage Harbor. Various portable pump-out facilites are also available (call 508-945-5185 for details and scheduling).

Trash

Trash is the most visible pollution in our waters. Designate a storage area on your boat specifically for trash and regularly take the trash to shore for proper disposal. Beverage cans, Styrofoam cups, plastic bags, fishing line fragments, and other debris can trap, injure, and kill aquatic life and birds. Most of this debris doesn't disintegrate; instead it remains in the waterways for years and continues to kill wildlife, foul propellers, and clog engine-cooling water intakes. It is illegal to dispose of any trash in navigable waters and within three nautical miles offshore. Federal violations are subject to substantial civil penalties and/or criminal sanctions, including fines and imprisonment. Local violations are subject to fines up to $200 per offense. Call the Coast Guard or the local Harbormaster if you see any boat, commercial or recreational, dumping plastics or other trash overboard.

Erosion

Boat wakes contribute to shoreline erosion, especially in narrow streams and inlets. This loss of land is a problem for Cape towns and also affects boaters. Eroded sediments can cause unwanted shoals and shallows, cut off light to underwater life, especially plants, and create tremendous problems for aquatic ecosystems. The extent of shoreline erosion caused by boat wakes depends on the wake's energy. This energy is based on four factors: distance from the shore, hull size, speed, and water depth. The closer to the shore, the greater the hull size, and the shallower the water, the more damage a boat wake can cause. To minimize shoreline erosion, boats should reduce wakes within 500 feet of the shore. Excessive wakes are prohibited within 150 feet of any shore being used as a swimming area; violations are subject to local fines. Many habitats near the shore, and the animals and plants that inhabit them, are sensitive to disturbance. Boaters, skiers, and jet skiers should avoid speed and excessive traffic in these fragile areas. Erosion from boat prop wash (agitation produced by the boat's propeller while the engine is in gear) is very often seen along docks and piers. If the boat is run in gear while tied up, sediments are stirred up and washed away, creating an artificial dredged area beside the dock. As these sediments resettle, they suffocate marine life in the surrounding area.

Docks and Piers

Excessive numbers of private docks collectively have negative impacts on our coastal bars and ultimately depreciate the value of waterfront homes. They may impair water circulation, alter bottom sediments, shade eelgrass and restrict access to shellfish beds. Rather than imperil the water body you live on with a new dock, consider sharing a communal pier or keeping your boat on a mooring. Further, many docks and piers are constructed with pressure-treated wood. The toxic materials used to help the wood last longer in the marine environment leach out slowly over time, killing marine plants and animals. Alternatives such as heart wood and many new plastic construction materials should be considered for new structures, repairs or replacements. Keep in mind that boats tied to docks can cause sediment changes that can destroy shellfish habitat.

Chapter 11

Not Just for Kids

Goin' Fishing. When you're trying to catch a big one, consider that lead sinkers and fishing lines are a hazard to wildlife. Water birds can swallow the sinkers lost from your line and die from lead poisoning. Instead of lead, use plated steel sinkers or washers and plated steel hooks. And be sure to properly dispose of your fishing lines so it won't entangle wildlife. Local tackle stores provide boxes for you to dispose of old line.

Beach Trash Pickup. Always carry out your own trash and any other trash you find on the beach. Friends of Chatham Waterways hosts an annual Coastal Sweep beach clean-up day; consult their website for more information (www.chathamwaterways.org).

Watershed Address. Find your Watershed Address on the maps in Chapter 1 of this booklet. Where does the rain that falls in your yard go?

Water Watch. Who's wasting water in your house? Be a water detective; check for leaky faucets and turn off the water while brushing your teeth or washing dishes. Learn about water-saving devices such as low-flow shower heads and appliances and talk to your parents about installing them.

Reduce, Reuse, and Recycle. We make a lot of unnecessary trash. Reduce the amount of trash you make: buy things with less packaging, fix things instead of buying new ones, recycle, and compost organic wastes. Donate to or find a treasure at the Gift House at the Transfer Station or local thrift store.

Get Your School Involved.

Friends of Chatham Waterways in partnership with others organizations in Chatham have encouraged the Chatham Schools to incorporate an extensive series of local field trips to learn about our waterways. The K-6 curriculum includes a ladder of "hands on" activities at all grade levels to give students experiences illustrating that all the water in and around Chatham – from the fresh water kettle ponds, underground in the loose glacial soils, flowing to the estuaries and bays – is connected. Parents and volunteers are encouraged to contact the Chatham Schools to ask about ways they can assist in field trips, caring for aquariums, animals and plants in the classroom, and gardening programs.

For Teens. With your parents, read the section on hazardous waste, then go on a toxics hunt around your house. Look for these warnings on the labels: DANGER, CAUTION, WARNING, POISON, CORROSIVE, CAUSTIC, INERT, FLAMMABLE, OR EXPLOSIVE. When these items are ready for disposal, they should go to the Household Hazardous Materials Collection Days, sponsored by the Towns of Chatham and Harwich. Why not find out how these hazardous wastes are collected? Learn about alternatives to these products and use them when you can.

Chapter 12

Taking Action: the Big Picture

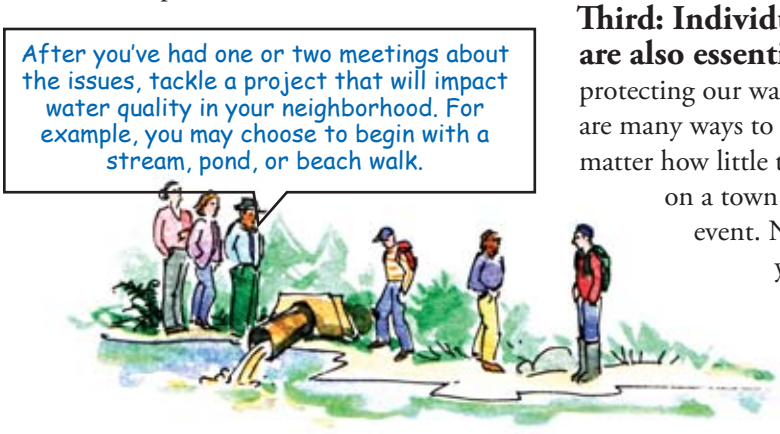
If we make healthy choices for our bodies, the chances are we'll be healthier. The same goes for our environment. We, residents and visitors alike, are stewards of our phenomenal water resources; our lakes, ponds, streams, tidal estuaries, wetlands, and harbors – and most precious of all, the groundwater aquifer. The health of these resources depends on the choices we make.

What can you and I do to preserve these resources today and for the generations to come?

Drawing by Kassie Foss

First: Everyone lives on the water. Refer to the maps in Chapter 1 of this booklet. Which watershed do you live in? Become familiar with your watershed. Think about what its resources mean to your daily life. How would your life be changed if you didn't have clean water to drink and swim in, and fish and shellfish to eat?

Second: Put into practice as many of the suggestions offered here as you can. You don't have to adopt them all at once. Start with one, or maybe several, and when they become part of your routine, add a few more. Talk with your family, friends, and neighbors about what you're doing "waterwise". Spread the "water word"!

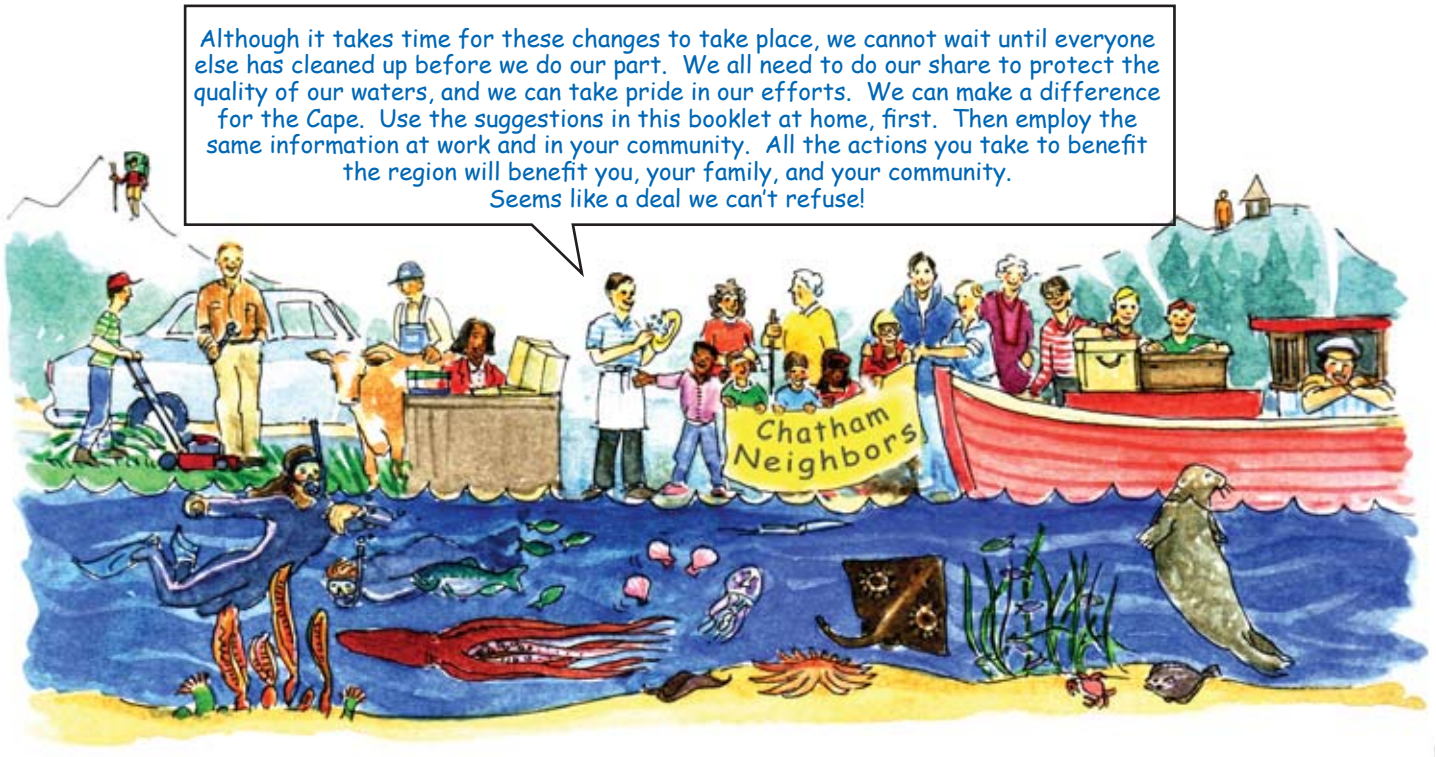


Third: Individual actions are important, but organizations are also essential. If you already belong to a group that is active in protecting our water resources – TERRIFIC! If you don't, remember, there are many ways to get involved. No matter what your interests and skills, no matter how little time you think you can offer, there's a place for you. Serve on a town board, join a conservation group or volunteer at a special event. No matter what you do, you'll be joining others who share your concerns and want to make a real contribution to safeguard our water resources. Here are some activities you may wish to consider:

- **Join your local watershed group** such as Friends of Chatham Waterways, Friends of Pleasant Bay, or a local "Friends of" pond group. If there is no watershed group in your area, start one!

- **Participate in a beach cleanup.** The main one is Coastal Sweep in September each year. Keep an eye on local newspapers for details. Better yet, be a proactive person and pick up any trash you see every time you walk the beach.

- **Volunteer to help at the Household Hazardous Waste Collections** held each year.
- **Help organize a public presentation on water issues.** Events are scheduled throughout the year.
- **Become an advocate for nitrogen and phosphorous removal technologies** for both home and municipal facilities. You can help inform others about new technologies that remove nitrogen from our waste and can help save our ponds and estuaries.
- **Help educate the next generation about the importance of protecting our water** by volunteering on school field trips to water resource areas, wastewater treatment facilities, and town wells.
- **Start your own initiative!** There are new approaches to water-related issues appearing daily. Maybe you have an idea no one has thought of. Every step forward counts. The goal is to protect our precious water resources, any way we can. Everyone has a stake in our water resources.



Chapter 13

Where to Go for Help…

Resources for taking the next steps

Citizen Advocacy Groups

Friends of Chatham Waterways, www.chathamwaterways.org
Chatham Alliance for Preservation and Conservation, P.O. Box 111, N. Chatham MA 02650
Friends of Pleasant Bay, www.fopb.org
Association to Preserve Cape Cod, www.apcc.org
Buzzards Bay National Estuary Program, www.buzzardsbay.org

Sustainable Energy

Cape Light Compact, www.capelightcompact.org
Cape Cod Community College, www.capecod.edu/envirotech
Cape and Islands Self Reliance, www.reliance.org
Massachusetts Department of Energy Resources, www.mass.gov/doer/programs/renew
Mass DEP: Renewable Energy & Energy Conservation, www.massgov/dep
Massachusetts Technology Collaborative, www.mtpc.org

Regional Planning

Cape Cod Commission, www.capecodcommission.org
Cape Cod Water Protection Collaborative, www.barnstablecounty.org/bbwastewater.htm
Pleasant Bay Resource Management Alliance, www.pleasantbay.org
South Coastal Harbor Plan, www.chatham-ma.gov

Conservation, Education, and Research Groups

Chatham Conservation Foundation, Inc., www.chathamconservationfoundation.org
Friends of Monomoy, www.friendsofmonomoy.com
Americorps, www.Americorps.org
Cape Cod Community College, www.capecod.edu/envirotech
Cape Cod Museum of Natural History, www.ccmnh.org
Center for Ocean Sciences Education Excellence, www.cosee-ne.net
Coastal Resources Committee, www.capecodcommission.org/coastal
Coastal Systems Group, www.smast.umassed.edu/Coastal/research/estuaries/estuaries.html
Massachusetts Audubon Society, Wellfleet Bay Wildlife Sanctuary, www.massaudubon.org
Massachusetts Estuaries Project, www.oceanscience.net/estuaries/index.htm
The Nature Conservancy, www.nature.org
The Ocean Conservancy, www.oceanconservancy.org
Provincetown Center for Coastal Studies, www.coastalstudies.org
Woods Hole Sea Grant Program, www.whoi.edu/seagrant
Woods Hole Research Center, www.whrc.org/capecod/index.htm

Local, State, and Federal Government Resources

Town of Chatham, www.chatham-ma.gov (508-945-5100); Coastal Resources (508-945-5146); Conservation Agent (508-945-5164); Health/Environment Director (508-945-5165); Harbormaster (508-945-5185); Parks (Beaches, Recreation) (508-945-5175)
U. S. Coast Guard: Chatham (Emergency: 508-945-0164) (Business: 508-945-3830)
Monomoy National Wildlife Refuge, http://monomoy.fws.gov
Barnstable County, www.barnstablecountyhealth.org
Cape Keepers, www.capekeepers.org
Cape Cod National Seashore, www.nps.gov/caco
Cape Cod Conservation District, (508) 771-8757
Cape Cod Cooperative Extension (Coastal Explorer Mobile Marine Science Exhibit), www.capecodextension.org/home.php
Gerry E. Studds Stellwagen Bank National Marine Sanctuary, http://stellwagen.noaa.gov
Massachusetts Office of Coastal Zone Management, www.mass.gov/czm
Mass Estuaries Project: Watershed/Embayment Nitrogen Management: www.smast.umassd.edu/Coastal/research/estuaries/estuaries.html
Massachusetts Bays Program, www.mass.gov/envir/massbays/capecod.htm
Massachusetts Department of Environmental Protection, www.mass.gov/dep/water
U.S. Environmental Protection Agency, www.epa.gov/ebtpages/water/html

Water Quality Testing in Chatham

Friends of Chatham Waterways, www.chathamwaterways.org
Town of Chatham, Health & Environment Department, www.chatham-ma.gov
Pleasant Bay Resource Management Alliance, www.pleasantbay.org

Fisheries and Shellfish Groups

Town of Chatham Shellfish Constable (508-945-5184) and Harbormaster (508-945-5183)
Cape Cod Commercial Hook Fishermen's Association, www.ccchfa.org
Cape Cod Stranding Network (508-743-9548); www.capecodstranding.net
Division of Marine Fisheries, Commonwealth of Massachusetts, www.state.ma.us/dfwele/dmf/index.html

Agriculture/Horticulture Research

Agriculture/Horticulture Research Cape Cod Cooperative Extension: www.capecodcooperativeextension.org
Barnstable County Conservation District, www.capecodcd.org
Cape Cod Cooperative Extension, www.capecodcooperativeextension.org
University of Massachusetts Cooperative Extension, www.umassextension.org

Chapter Reference Material

Chapter 1 – A Water Primer

Local and State Resources:

Massachusetts Estuaries Project, Linked Watershed-Embayment Model to Re-Evaluate Critical Nitrogen Loading Thresholds for Stage Harbor/Oyster Pond, Sulphur Springs/Bucks Creek and Taylors Pond/Mill Creek, Chatham, Massachusetts, Final Report, February 2007.

Massachusetts Estuaries Project, Linked Watershed-Embayment Model to Determine Critical Nitrogen Loading Thresholds for the Pleasant Bay System, Orleans, Chatham, Brewster, and Harwich, Massachusetts, Final Report, 2006

Town of Chatham Open Space and Recreation Plan, Draft, 2009.

Town of Chatham South Coastal Harbor Management Plan, 2005.

Pleasant Bay Resource Management Alliance, Pleasant Bay Resource Management Plan, 2008.

Chapter 2 – A Quick Start for the Water Wise

Groundwater Guardians, www.capecodcommission.org/gwguardians/home.htm
100 Water-Saving Tips, www.wateruseitwisely.com/100ways/ne.shtml
Water Awareness Test, www.getwise.org

Chapter 3 – Water, Water Everywhere

Save Our Planet: 750 Everyday Ways You Can Help Clean Up the Earth, MacEachern

Water saving devices, www.eartheasy.com/live_water_saving.htm

Chapter 4 – Out of Sight, Out of Mind

Title 5 Septic Systems, Massachusetts Department of Environmental Protection, www.mass.gov/dep/water/wastewater/septicsy.htm
For more information on alternative systems: Alternative Septic System Test Center, www.buzzardsbay.org/etimain.htm
Department of Environmental Protection, www.state.ma.us/dep/brp/wwm/t5itprog.htm
National Small Flows Clearinghouse, www.nesc.wvu.edu/nsfc/nsfc_index.htm

Chapter 5 – Hazardous Waste? Not in my House!

Town of Chatham, www.chatham-ma.gov (508) 945-5100
Household hazardous product collections, www.capecodextension.org/home.php
Massachusetts DEP Household Hazardous Products Hotline, (800) 343-3420
Lower and Outer Cape public transportation, www.theflex.org, (800) 352-7155

Chapter 6 – Rethink/Reuse/Recycle

Chatham Recycles, www.chathamrecycles.org
Donate computers, www.cristina.org
Recycle electronics, www.mass.gov/dep/recycle/reduce/electron.htm

Massachusetts EPA Motor Oil Information, (617) 556-1022
Used motor oil recycling, www.recycleoil.org
Get on "Do Not Mail" lists: send a letter with your name, home address and signature to Mail Preference Service, Direct Marketing Association, P.O. Box 643, Carmel, NY 10512
Stop receiving unsolicited credit offers, (888) 567-8688, www.optoutprescreen.com
For more tips on reducing your junk mail, www.globalstewards.org or stopthejunkmail.com
Cape Cod Cooperative Extension: www.capecodcooperativeextension.org

Chapter 7 – Spare that Shrub!

Save Our Planet: 750 Everyday Ways You Can Help Clean Up the Earth, MacEachern
Sea Grant Woods Hole, "Focal Point" Newsletters:
"Cape Cod Coastal Erosion: A Case Study", April 1998
"Shoreline Change and the Importance of Coastal Erosion," April 2000
"Sustaining Coastal Landforms," January 2001
"Evaluation of Coastal Erosion Hazards: Results from a National Study and a Massachusetts Perspective," August 2001
"Coast Lines," the annual magazine of the Massachusetts Office of Coastal Zone Management
Commonwealth of Massachusetts, Department of Environmental Protection brochure:
"Clean Water Tips - Nonpoint Source Pollution and What Can You Do To Help"
Massachusetts Wetlands Protection Act and Regulations, contact Chatham Conservation Commission, (508) 945-5164
DEP Nonpoint Source Program, www.mass.gov/dep/brp/wm/wmpubs.htm
DEP Southeast Regional Office, (508) 946-2714
Massachusetts Coastal Zone Management, www.mass.gov/czm
Sea Grant Program, Woods Hole Oceanographic Institution, www.whoi.edu/seagrant
Cape Cod Cooperative Extension, www.capecodcooperativeextension.org

Chapter 8 – Landscaping for Healthy Watersheds

The Cape Cod Garden – A Handbook for Successful Planting, C. L. Fornari
The Gardener's Guide to Common-Sense Pest Control, William Olkowski
A Guide to Invasive Plants in Massachusetts, Wetherbee, Somers and Simmons
Native Plants of the Northeast – A Guide for Gardening and Conservation, Donald J. Leopold
Seascape Gardening, Anne Halprin
For testing soil samples, www.capecodextension.org
Bayscaping, www.peconicbaykeeper.org/getinv/bayscp.htm
Compost Extension, www.capecodcooperativeextension.org
Edible Cape Cod, www.ediblecapecod.com/pages/articles/summer *See Tim Friary - Organic gardening*
Red worms for composting available on the Internet
Coastlines, CZM: Greenscapes for a Blue Planet: *The Greenscape Scoop* and *A Landscape Fit for the Sea*. Betsy Richards

Chapter 9 – Recovery from Lawn Obsession

All-New Encyclopedia of Organic Gardening, Rodale Books
Redesigning the American Lawn, A Search for Environmental Harmony, F. Bormann et al.
Alternative Pest Controls for Lawns and Gardens, Rachel Carson Council, www.members.aol.com/rccouncil/ourpage
US Environmental Protection Agency, www.epa.gov/pesticides/controlling/garden.htm
www.chem-tox.com/pesticides
www.grassrootsinfo.org
www.ecochem.com/pesticides.html
To landscape with moss, www.mossacres.com
Buzzards Bay National Estuary Program, http://www.buzzardsbay.org/lawncare.htm
Cape Cod Cooperative Extension, www.capecodcooperativeextension.org
Massachusetts Department of Environmental Protection, www.mass.gov/dep/

Chapter 10 – Getting Out on the Water

Coast Guard Auxiliary, http://nws.cgaux.org/visitors/ve_visitor/index.html
Eco-friendly boating, www.eartheasy.com/play_eco-friendly_boating.htm
Environmental tips, aquatic nuisance species, online boating course and more, www.boatus.com/foundation/toolbox/EnvirTips.htm
Many resources on good boating practices, www.americanboating.org/goodstuff.asp

Chapter 11 – Not Just for Kids

Cape Cod Museum of Natural History, www.ccmnh.org
Cape Cod Pathways, www.capecodcommission.org/pathways/home.htm
The Ocean Conservancy, www.oceanconservancy.org.
Wellfleet Bay Wildlife Sanctuary, www.massaudubon.org
Woods Hole Science Aquarium, www.nefsc.noaa.gov/nefsc/aquarium

Chapter 12 – Taking Action

Coastal Sweep, www.coastsweep.umb.edu
Friends of Chatham Waterways, www.chathamwaterways.org
Friends of Pleasant Bay, www.fopb.org

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"This book was born on the shores of Puget Sound. The Puget Soundbook ©2003, 1991, by author James A. Kolb and illustrator Dianne Gusset Bressler was originally funded by the Puget Sound Water Quality Authority and is part of the award-winning FOR SEA family of curriculum guides for grades 1-12, available from FOR SEA Institute of Marine Science, Indianola, Washington 98342 (www.forsea.org).

"With permission, The Puget Soundbook grew into The Island Blue Pages. The "Booklet Committee," a dedicated group of volunteers from Vineyard environmental groups, the Martha's Vineyard Commission, and town employees under the leadership of the Martha's Vineyard Shellfish Group, adapted it to the East Coast waters of Martha's Vineyard and the Wampanoag Tribe of Gayhead (Aquinnah) provided major funding. For a complete version of The Island Blue Pages, visit the website www.islandbluepages.org or contact the Martha's Vineyard Shellfish Group at 508-693-0391.

"The Orleans Pond Coalition, with permission, adapted The Puget Soundbook and The Island Blue Pages to The Orleans Blue Pages reflecting conditions specific to Orleans but also generic to Cape Cod in hopes other organizations would continue to spread the word to protect our waters. To learn more about OPC, a not-for-profit organization dedicated to preserving and protecting fresh and marine waters, visit the website www.orleanspondcoalition.org. For information on reproducing these materials, email info@orleanspondcoalition.org. Orleans Pond Coalition is not responsible for future adaptations of The Orleans Blue Pages."

Friends of Chatham Waterways (FCW), with permission, adapted The Puget Soundbook, The Island Blue Pages, and The Orleans Blue Pages to Chatham Blue Pages drawing attention to qualities that are unique to Chatham as well as generic to Cape Cod, in the hope that other towns will want to protect their waters also.

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